The Future of Warfare

Issues from the

1999 Army After Next

Study Cycle

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The Chief of Staff of the Army (CSA) initiated the Army After Next (AAN) project, led by the Training and Doctrine Command (TRADOC), in February 1996. The project's goals were to link Army XXI to a long-term vision of the Army extending several decades into the next century and to ensure that this vision informed Army research and development requirements. TRADOC's Deputy Chief of Staff for Doctrine (DCSDOC) requested that RAND support this effort.

Within the AAN project, TRADOC sponsors and encourages Integrated Idea Teams, franchises, and wargames in areas of interest. The annual AAN cycle of events culminates in the Spring Wargame (SWG), which draws together efforts in many different fields.

This report presents RAND Arroyo Center's analysis of the AAN annual cycle during fiscal year 1999, including the Army Special Operations Wargame, the Army Medical Department Game, the Information Operations Wargame, the Space Game, the Force Projection Game, the National Security Seminar (NSS), the Campaign Planning Workshop (CPW), the Pre-Assessment Session, and the Spring Wargame. The Arroyo Center previously reported to TRADOC on these events in project memoranda, intended only for the sponsor, and a draft not cleared for open publication.

In October 1999, after the year's AAN series of games was completed, the Army leadership announced the new Army Transformation Plan. The Transformation Plan includes some features of AAN-based research, but varies in other aspects (for example, the Transformation Plan assumes that divisions will remain the main Army tactical

organization, as opposed to the Battle Forces that were postulated in AAN). This report highlights the events and insights from the 1999 AAN series, but will occasionally refer to the Transformation Plan for purposes of clarity and to avoid confusion.

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TABLES

This report describes the Army After Next (AAN) cycle of events during fiscal year (FY) 1999, discusses issues that arose during this cycle, presents observations on the Spring Wargame (SWG), and offers suggestions to improve the AAN process. Although the Transformation Plan has now largely taken the place of the AAN process, many of the issues that emerged in AAN SWG-99 merit examination in relation to the Army as envisioned in the current Transformation Plan.[1]

PURPOSE OF AAN

In February 1996, the Chief of Staff of the Army gave the Commander of the U.S. Army Training and Doctrine Command (TRADOC) a broad charter to explore the nature of warfare thirty years into the future and to help develop a long-term vision of the Army. The mission of the AAN project was to conduct broad studies of war to about the year 2025, frame issues vital to the development of the U.S. Army after about 2010, and provide issues to senior Army leadership

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[1]The Army Transformation Plan envisions the transformation of the Army along three paths: the Objective Force, the Legacy Force, and the Interim Force. The objective is to produce a force that is responsive, deployable, agile, versatile, lethal, survivable, and sustainable. The Objective Force will eventually encompass the entire Army. It will be capable of placing a combat brigade anywhere in the world in 96 hours; putting a division on the ground in 120 hours; and placing five divisions on the ground in theater in 30 days. The Legacy Force is essentially today's Army recapitalized through modernization programs such as the insertion of digital technologies. The Interim Force will bridge the gap in capabilities between today's Army and the Objective Force. See *http://www.army.mil/armyvision/transform.htm* for more information on Army Transformation.

in a format suitable for integration into TRADOC combat develop-
ment programs. This long-term vision was designed to connect to
the Army's research and development programs. The Strike Force
initiative embodied AAN concepts and was to provide a bridge from
current Army forces, using today's technologies, to future Army
forces, exploiting technological breakthroughs. The Strike Force
concept was deleted from consideration while this report was being
prepared. The concepts announced in the Transformation Plan are
based in part on the results of AAN studies.

THE FIRST THREE YEARS

From a standing start four years ago, AAN has evolved into a highly
sophisticated process, which includes integrated idea teams, fran-
chises, tactical-level analyses, and technology seminars, culminating
in a high-level, free-play wargame whose results are briefed to senior
Army leadership. In each of the three years from 1997 through 1999,
AAN has made important advances in the examination of Battle
Forces, which embody futuristic thinking about Army forces. Battle
Forces were notional organizations that would facilitate examining
future warfare without the constraints associated with current units.

In the first year, AAN envisioned radically different Army forces,
which could globally self-deploy and maneuver vertically to engage
enemy heavy forces in fire ambushes (air-mechanized Battle Forces).
The purpose was to stimulate innovative thinking unconstrained by
current doctrine or—for the time being—foreseeable technology.

In the second year, AAN constrained air-mechanized Battle Forces by
foreseeable technology and tested them against opponents who
understood the air-mechanized concept and could develop counters.
The result was to expose issues, including vulnerability to opposing
air defenses, inability to hold ground, and lack of survivability in
close combat, especially when imposed by urban terrain.

In the third year, AAN introduced a spectrum of Battle Forces, de-
ployed in a variety of ways (airborne, airlifted, self-deploying by air,
sealifted) and equipped with combat vehicles weighing from 2.5 to 26
tons. This spectrum allowed a much broader look at futuristic Army
forces and comparative analysis of competing and complimentary
concepts.

Since the announcement of the Army Transformation Plan, emphasis has shifted away from AAN to research focused on the forces and concepts associated with the new plan. Nevertheless, many of the ideas of the Transformation had their origin in AAN, and many of the issues raised in this report merit examination in terms of the Transformation Plan and the Interim and Objective Forces.

ISSUES

The following issues emerged from the AAN process during the FY99 cycle.

Coalition Warfare

Although prepared to fight alone if necessary, the United States usually fights in an alliance or coalition. During AAN SWG-99, coalition forces conducted operations, for all intents and purposes, as if they were U.S. forces. Differences in doctrine, communications, and proficiency of the various national forces were essentially nonexistent and coalition governments posed no limitations on the use of their forces.

If the United States could quickly and easily form a powerful and reliable coalition against a major competitor, it would be in the U.S. interest to train and equip non-U.S. forces to the highest possible standard, knowing that they would be the first to engage. Non-U.S. forces might substitute for U.S. forces. In the more likely circumstance that non-U.S. forces would not be as effective and could not be relied upon, the requirement for U.S. land forces would be greater than appeared during AAN SWG-99.

Strategic Preclusion

According to game material, strategic preclusion implied that U.S. forces would accomplish one or more of these objectives:

- Prevent an enemy from achieving his initial goals.
- Deter an enemy from escalating the conflict.
- Create conditions for an enemy to fail in the end.

RAND Insight: The third criterion tends to make strategic preclusion synonymous with eventual U.S. success. If the United States ultimately succeeds in a conflict, it will have created conditions for the enemy to fail. Thus even campaigns with extremely poor starts, e.g., the Pacific in World War II or the Korean conflict, satisfy this third criterion for "preclusion." A better definition of strategic preclusion would read: "The United States and its allies achieve strategic preclusion by deploying capable forces so quickly that an enemy cannot achieve his initial goals or escalate the conflict to his advantage."

Nuclear-Armed Opponent

If the United States tried to conduct a conventional campaign against a major nuclear power in a region contiguous to its homeland, the National Command Authority (NCA) would be concerned that the enemy would target all types of U.S. forces within his delivery range. If the NCA did decide to employ large land forces, they would have to operate in ways that did not create lucrative targets for nuclear weapons, take measures to survive nuclear use, and plan for recovery and reconstitution following a strike.

In a real-world situation, U.S. decisionmakers would be unlikely to commit U.S. forces against a nuclear-armed opponent without having decided in advance how they would respond to nuclear use. It is uncertain whether U.S. decisionmakers would believe that a nuclear-armed opponent would allow U.S. forces to attain strategic preclusion before he resorted to nuclear use.

Exploitation of Space

The United States would want to deny an opponent access to space-based intelligence, surveillance, and reconnaissance (ISR) while retaining its own access, but an all-out space war might blind both sides. Moreover, the United States and its allies might not be able to control commercial space assets except at the price of disrupting their own commercial viability.

During the Space Game, Red and the Commercial Team both adopted a policy of unconstrained access to space during conflict. In

contrast, Blue wanted to obtain a unilateral advantage in space and tried with little success to restrict Red access to commercial services, even at the expense of its own access. As a result, the Commercial Team perceived Blue as a bully and Red as a defender of international law.

If an opponent's military systems were lost, he might still satisfy some of his ISR needs through access to commercial services. It is unclear how the United States and its allies could deny an opponent access to commercial service without severely limiting its own access. In view of these difficulties, an opponent might have at least some access to commercial systems during a conventional military campaign.

An actual decision to initiate space warfare by the United States or its opponents would be a complex one. Timing, determining which side would benefit more from a disruption of space assets, and the ability or inability to limit the effects and extent of a space war would influence such a decision.

Sea Control

The United States is accustomed to operating freely throughout the world's oceans. But in some future conflict, it might need to gain sea control very rapidly in constricted waters against an opponent with modern weapons. For example, during AAN SWG-99, failure to quickly gain control of the Black Sea would have had a very significant impact on the campaign because Blue and Green forces and supplies flowed into the theater via Black Sea ports and Blue naval forces made significant contributions to the tactical missile defense (TMD) and interdiction of Red forces. Littoral warfare is of primary interest to the Marine Corps, but the Army might also be engaged. For example, light Army forces might operate again from an aircraft carrier as during the intervention in Haiti in September 1994.

Air Superiority

Air superiority is a complex mission that entails operations against manned aircraft, ballistic missiles, cruise missiles, and air defenses. The United States and its allies will probably continue to enjoy a

great advantage in all aspects of manned flight. Ballistic missiles, cruise missiles, and air defenses, especially low-level passive defenses, could pose greater challenges to allied air superiority.

Potential opponents may shift their emphasis to ballistic and cruise missiles. For example, during AAN SWG-99, Red used medium-range ballistic missiles, large numbers of cruise missiles, and conventionally armed intercontinental ballistic missiles (ICBMs) launched from Red's homeland to attack seaports and airfields used by Blue. Cruise missiles currently are expensive and therefore limited in numbers, even for U.S. forces, but advances in the microprocessing industry will almost certainly reduce costs.

Sustainment

In all likelihood, future forces will still depend on deployment and logistics support delivered through APODs (aerial ports of debarkation) and SPODs (seaports of debarkation), which could be vulnerable to air attack. Against such an opponent, the United States would require an effective theater missile defense, a difficult technical problem to solve.

Chemical weapons might also pose significant challenges, possibly much more than was the case in AAN SWG-99. During this game, Red used chemical weapons against Blue bases, but to little effect. Even well-trained military units might be severely affected and civilian workers, including some indispensable to base operations, might be incapacitated or take flight. To counter this threat, the United States and its allies would have to mount a comprehensive defense, which embraced not only military units, but also the civilian workforce. Additionally, the threat of chemical weapons might force the United States to fight from standoff distances for at least part of the campaign.

Battle Forces have a notional tempo of operations significantly faster than current Army forces and at greater distances from their support bases. Keeping these forces resupplied presents great challenges. Conceptually, Battle Forces would rotate through forward resupply points, for example in a scheme that kept four Battle Units available for combat while two Battle Units engaged in resupply. However, the game did not have enough granularity to test this concept.

Urban Terrain

In contrast to previous years, Battle Forces were designed as combined arms formations capable of operating in all types of terrain. However, they were optimized for rapid operational maneuver, and players therefore preferred to employ other forces, especially heavier forces in urban terrain. The Light-Motorized Battle Force was optimized for urban operations, but not employed in this way during the Spring Wargame.[2] Players thought that operational commanders should consider alternatives to urban combat and undertake it only if required by the military situation or directed by higher authority for political reasons. It should be understood, however, that enemy actions may make urban battles unavoidable in some situations.

RAND Insight: Vertical maneuver would be very risky or infeasible against an opponent employing low-altitude air defense systems, especially man-portable missile systems, in urban terrain. Combat vehicles vulnerable to man-portable anti-tank weapons would have very limited utility. Long-range precision fires would encounter severe problems of masking.

Refugees During Conflict

Since the Korean War the United States has not had to conduct large ground combat operations while simultaneously handling problems posed by refugees. Some future contingency might simultaneously pose both requirements. During AAN SWG-99, the magnitude of the refugee problem hampered Blue operations. Initial deployment of Blue forces had been heavily biased toward combat units. As a result, support units were in short supply and Blue commanders initially lacked resources to address the refugee problem.

By 2020, the world's population will be much larger and more heavily concentrated in urban areas. Future combat operations conducted near heavily populated areas will generate large numbers of refugees, who will impede military operations and require humanitarian assis-

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[2] The LMBF was located a considerable distance south of Tbilisi. It was adjudicated that the force would not be able to reach the city in time to contribute effectively. It was out of range because of its position in the TPFDD. Other priority units arrived ahead of it.

tance. Requirements for assistance may drain military resources, particularly in areas close to combat zones, where civilian relief agencies are not yet established. All the services may be affected, but especially the Army, which might have to operate intermingled with refugees. To solve this problem, the Army will need to develop its own first response plans and methods of handing off quickly to civilian relief agencies.

Air Mobility of Battle Forces

To realize the Battle Force concept, it was necessary for supporting aircraft to fly within range of low- to medium-altitude air defense systems, making survivability of these aircraft an issue. If the Army develops forces to exploit Super Short Takeoff and Landing (SSTOL), assets maintained by a sister service and centrally controlled, then allocation of these assets would become an issue. During AAN SWG-99, Blue inserted Battle Forces using SSTOLs owned by the Air Force and Joint Transport Rotorcraft (JTR) owned by the Army.

When airborne in forward areas at low altitude, SSTOL and JTR are vulnerable to ground-based air defenses. During AAN SWG-99, Red inflicted significant losses to JTRs and SSTOLs through low-altitude air defenses on several occasions. When on the ground, they are vulnerable to attack by ballistic and cruise missiles and other indirect-fire systems. It is technically infeasible to give these aircraft stealth characteristics, and arming them would have significant drawbacks. They might be provided with escorts, electronic countermeasures (ECM), and self-defense systems such as used in current special operations aircraft. The Army and Air Force might also develop joint tactical doctrine to reduce the vulnerability of these aircraft, for example by providing appropriate escort and sweeping their landing zones with fire. Additional challenges posed by the AAN concepts of air-mobile operations deep in the enemy rear include the issues of how U.S. forces will disengage following battles that take place in enemy-controlled areas, and what the enemy's ability to recover will be once air-mobile U.S. forces disengage and depart.

The Air-Mobile Battle Force (AMBF) concept required strategic airlift into theater and operational-level air mobility. Strategic airlift implies any transport aircraft capable of lifting forces over intercontinental distances (e.g., C-5, C-17, and C-141). Operational-level

air mobility implies an extremely robust aircraft capable of landing on level ground and unimproved airstrips, such as the SSTOL. To pursue such a concept for the Objective Force, the Army would have to procure SSTOLs (or comparable aircraft) or else be assured that the Air Force would procure them and make them available for operations.

Survivability of Battle Forces

Battle Forces were designed as light- to medium-weight forces deployed (with one exception) by air and maneuvering by air within theater. One type of Battle Force (the Mechanized-Armor Battle Force (MABF), see Appendix C) was designed for movement by ship, all other types were capable of air movement, including on organic aircraft. Like all such forces, they trade passive protection for mobility, causing their survivability to become an issue.

AAN SWG-99 suggested that the Battle Forces would be ready to operate offensively and defensively against a variety of threats in many different types of terrain. Aircraft survivability may be as great an issue as protection of ground systems. Finally, survivability may be significantly improved by degrading the enemy's command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) systems.

Training Battle Force Soldiers

Several AAN franchise games highlighted the issue of training the future soldier. Higher operational tempo, dramatic increase in unit dispersion, and more flexible tactics would require intensive, highly sophisticated training to produce the required level of individual initiative at all levels.

To realize the operational concepts envisioned for Battle Forces, the Army would have to revise its training regime. This training would have to emphasize individual initiative and decentralized decision-making down to the level of vehicle commanders. Battle Force soldiers would have to become highly self-reliant, accustomed to operating for extended periods without immediate supervision or control. There would be a high demand for skilled soldiers in many

career fields at relatively low grades, unless Battle Forces were entirely manned by soldiers at mid-enlisted grades and above, as some special operations forces are today.

Hybrid Force Employment

In 2022 the Army will include both Army XXI forces and new types of forces that emerge from the AAN and Army Transformation processes.[3] The game showed that both Army XXI and Battle Forces would have appropriate roles in a hybrid force. During AAN SWG-99, the main roles of Army XXI units were in combat service support and theater missile defense. In Case B, Army XXI maneuver forces had few opportunities for employment in combat. Instead, coalition forces (which were assumed to be very capable, generally self-supporting, and available in considerable quantity) performed many of the roles that might have been performed by Army XXI–type forces.

RAND Insight: Battle Forces, when combined with air, naval, and coalition ground forces, were assessed to be overwhelming. Essentially, whenever Blue ground forces engaged a Red unit, Red was defeated. Based strictly on game play, there was little need for Army XXI maneuver units, particularly in Case B. By the end of the game, Blue had routed or defeated Red while employing a small fraction of the Army's total force structure. If the assessment process had concluded that the AAN-type forces were less successful, the role of Army XXI forces would have been greater.

CONCLUSIONS

AAN wargames would benefit from more realistic play of coalition operations.

AAN focused on coalitions formed of the United States with its European allies. These coalitions have tended to be remarkably free of problems. But in the real world, coalitions may be difficult to form and hard to lead effectively. At the very least, they will be affected by technical, organizational, and cultural incompatibilities. Insisting on

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[3]Although the Transformation Plan calls for an Objective Force that encompasses the entire Army, some current forces will probably continue to exist in the Army of 2020.

more realism would help generate more insights into the coalitions, especially the Army's role in helping build and maintain them. More specifically, the role of future forces within coalitions needs exploration. Leap-ahead technologies would give these forces capabilities unmatched even by the closest U.S. allies and also create technical incompatibilities.

AAN SWG-99 suggested that highly effective coalition forces might substitute for Army XXI maneuver units.

From the inception of the AAN project, the Army assumed that its forces in 2020–2025 will be hybrid, i.e., a mix of Army XXI units and more modern Battle Forces. The past three iterations generated insights into how these disparate forces might operate together. During the first two iterations, Battle Forces arrived earlier and maneuvered more rapidly (by air). They destroyed or disrupted opposing forces before they could respond effectively. Army XXI forces arrived later and maneuvered more slowly (by land). They consolidated the gains made by Battle Forces and accomplished essential missions, especially seizure of key urban areas, which exceeded the capabilities of Battle Forces.

During AAN SWG-99, Battle Forces operated in conjunction with powerful U.S. Air Force, Navy, and Marine Corps elements plus highly capable coalition forces. In contrast with earlier iterations, Battle Forces had less opportunity to operate in conjunction with Army XXI maneuver units, particularly in Case B. To a large extent, coalition ground forces had the role played by Army XXI forces during previous iterations. Had the assessment process come to different conclusions about the effectiveness of Battle Forces, or had coalition forces been less capable or less numerous, the role of Army XXI maneuver units would have been more important.

FY99's widened spectrum of Battle Forces was an important advance for AAN research.

During the first two years, the AAN project focused attention on ground forces that employed some form of airlift in theater. But during the third year, the AAN project examined Battle Forces that used other operational concepts. At one end of the spectrum, the Light Airborne Battle Force (LABF) with 2.5-ton vehicles could airdrop into a theater of operations, while at another end of the spec-

trum, the MABF with 26-ton vehicles went by sealift. This move toward multiple types of notional Battle Forces provided more options for exploration. As TRADOC explores the Objective Force, analysis and gaming should consider a wide range of alternative forces and operational concepts.

ACKNOWLEDGMENTS

ABBREVIATIONS

As a general rule, titles are capitalized, e.g., "Air Assault Battle Force," while commonly used terms are not, e.g., "air assault." In some instances, the same words might be either title or term depending on context, e.g., "Commander in Chief, U.S. Space Command" versus "commander in chief" (unspecified).

AA	air assault
AABF	Air Assault Battle Force
AAN	Army After Next
ABL	airborne laser
AC	active component
ACV	Advanced Combat Vehicle
ADM	atomic demolitions munition
AEF	Air Expeditionary Force
AFDO	advanced full dimensional operations
AMBF	Air-Mobile Battle Force
AMEDD	Army Medical Department
AOE	Army of Excellence

AOR	area of responsibility
APOD	aerial port of debarkation
ARCAS	Advanced Robotic Counter Air System
ARES	Advanced Robotic Engagement System
ARSOF	Army special operations forces
ATT	Advanced Theater Transport
BF	Battle Force
CA	civil affairs
CAP	combat air patrol
CAV	Combat Aerospace Vehicle
CINC	commander in chief
CINCSOUTHWEST	Commander in Chief, Southwestern Direction
CINCSPACE	Commander in Chief, U.S. Space Command
CINCWEST	Commander in Chief, West
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CJEF	Combined Joint Expeditionary Force
CJEF-A	Combined Joint Expeditionary Force—Case A
CJEF-B	Combined Joint Expeditionary Force—Case B
CONPLAN	concept plan
CONUS	continental United States
CPW	Campaign Planning Workshop
CRAF	Civil Reserve Air Fleet
CSA	Chief of Staff of the Army

CSS	combat service support
CVBG	carrier battle group
DCSDOC	Deputy Chief of Staff for Doctrine [TRADOC]
DCINC	deputy commander in chief
ECM	electronic countermeasures
EMP	electromagnetic pulse
FCV	Future Combat Vehicle
FES	Federation of Eurasian States
FPWG	Force Projection Wargame
FY	fiscal year
GBL	ground-based laser
GPS	Global Positioning System
GR	Greece
hybrid	As in "hybrid Army": having varying degrees of modernization, e.g., Army XXI, Battle Forces
ICBM	intercontinental ballistic missile
Interim Force	Force designed to bridge the gap between today's Army and the future Objective Force
IO	information operations
ISR	intelligence, surveillance, and reconnaissance
IT	Italy
JEF	Joint Expeditionary Force
JFACC	Joint Force Air Component Commander
JTR	Joint Transport Rotorcraft
LABF	Light Airborne Battle Force

LMBF	Light-Motorized Battle Force
LOC	line of communications
MABF	Mechanized-Armor Battle Force
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MOE	measure of effectiveness
NATO	North Atlantic Treaty Organization
NCA	National Command Authority
NEO	noncombatant evacuation operation
NGO	nongovernmental organization
NIR	New Independent Republic
NOST	National Operations Support Team
NSS	National Security Seminar
N-TACM	Naval Tactical Missile
Objective Force	Emerging post-2010 vision of the Army
OCA	offensive counter-air
RC	reserve component
REF	Regional Engagement Force
SAG	Surface action group
SAM	surface-to-air missile
SBL	space-based laser
SEAD	suppression of enemy air defense
SLOC	sea lines of communication
SOF	special operations forces

SOV	Space Operations Vehicle
SPOD	seaport of debarkation
SSTOL	super short takeoff and landing
SWG	Spring Wargame
TMD	tactical missile defense
TPFDD	Time Phased Force Deployment Data
TRADOC	U.S. Army Training and Doctrine Command
Transformation Plan	Plan initiated by the Army to transform today's Army into the Objective Force
TU	Turkey
UAV	unmanned aerial vehicle
UK	United Kingdom
UNHCR	United Nations High Commissioner for Refugees
USAF	United States Air Force
USMC	United States Marine Corps
VTOL	vertical takeoff and landing
WMD	weapons of mass destruction
WNN	World News Network

INTRODUCTION

This report describes the Army After Next (AAN) cycle of events during fiscal year (FY) 1999, discusses issues that arose during this cycle, and offers broad conclusions on progress in AAN to October 1999.

PURPOSE OF AAN

In February 1996, the Chief of Staff of the Army established the Army After Next program "to assist our leadership in developing a vision of future Army requirements."[1] The mission of the program was stated to be "(1) to conduct broad studies of warfare to about the year 2025, (2) to frame issues vital to the development of the U.S. Army after about 2010, and (3) to provide issues to senior Army leadership in a format suitable for integration into TRADOC combat development programs."[2]

The time frame envisioned for the research was roughly thirty years into the future. The CSA's guidance was to

- Connect Force XXI, the Army's process of change, to the long-term vision of the Army.

- Connect the vision to the Army's research and development programs.

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[1] U.S. Army Training and Doctrine Command, *Knowledge and Speed: The Battle Force and the Army of 2025*, Fort Monroe, Virginia, 1998, p. 1.
[2] Ibid.

- Leverage the work already accomplished in the Office of the Secretary of Defense on the Revolution in Military Affairs initiative.

- Institutionalize the program to ensure continuity and quality of effort.

- Think joint and involve the other services.[3]

This long-term vision was designed to connect to the Army's research and development programs. The Strike Force initiative embodied AAN concepts and was to provide a bridge from current Army forces, using today's technologies, to future Army forces exploiting technological breakthroughs. The Strike Force concept was dropped from consideration while this report was being prepared. The Army Transformation Plan, initiated in October 1999, does, however, benefit from various concepts that had their origin in the Army After Next process.[4]

THE FIRST THREE YEARS

From a standing start four years ago, AAN evolved into a highly sophisticated process that included integrated idea teams, franchises (which specialize in certain functional areas such as space, medical, etc.), tactical-level analysis, and technology seminars, culminating in a high-level, free-play wargame whose results are briefed to senior Army leadership. In each of the three years from 1997 through 1999, AAN has made important advances in the examination of Battle Forces, which embody futuristic thinking about Army forces.

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[3] Ibid., p. 2.

[4] The Army Transformation Plan envisions the transformation of the Army along three paths: the Objective Force, the Legacy Force, and the Interim Force. The objective is to produce a force that is responsive, deployable, agile, versatile, lethal, survivable, and sustainable. The Objective Force will eventually encompass the entire Army. It will be capable of placing a combat brigade anywhere in the world in 96 hours; putting a division on the ground in 120 hours; and placing five divisions on the ground in theater in 30 days. The Legacy Force is essentially today's Army recapitalized through modernization programs such as the insertion of digital technologies. The Interim Force will bridge the gap in capabilities between today's Army and the Objective Force. See *http://www.army.mil/armyvision/transform.htm* for more information on Army Transformation.

The AAN process consists of three main features: studies, wargames, and analysis. This process became broader and deeper during the first three years of the project. Studies were conducted by TRADOC or other agencies to examine operational concepts and/or technologies. The annual wargames were the highlight of the year's effort. Following the wargames, analysis was conducted to examine various issues that surfaced during the games or pregame studies.

In the first year, AAN envisioned radically different Army forces, which could globally self-deploy and maneuver vertically to engage enemy heavy forces in fire ambushes (air-mechanized Battle Forces). The purpose was to stimulate innovative thinking unconstrained by current doctrine or—for the time being—foreseeable technology.

In the second year, AAN constrained air-mechanized Battle Forces by foreseeable technology and tested them against opponents who understood the air-mechanized concept and could develop counters. The result was to expose limitations, including vulnerability to opposing air defenses, inability to hold ground, and lack of survivability in close combat, especially when imposed by urban terrain.

In the third year, AAN introduced a spectrum of Battle Forces, deployed in a variety of ways (airborne, airlifted, self-deploying by air, sealifted) and equipped with combat vehicles weighing from 2.5 to 26 tons. This set of five Battle Forces was examined during the series of events culminating in AAN SWG-99 (Spring 1999 Wargame). This allowed a broader look at futuristic Army forces and comparative analysis of competing concepts. Appendix C provides a brief summary of the different types of Battle Forces that were included in AAN SWG-99.

ORGANIZATION OF THIS REPORT

Chapter Two gives an overview of AAN-related events during FY99, including franchise games and the Army After Next SWG-99 series. Chapter Three presents major issues, framed as research questions related to the themes and objectives set for the AAN process. For each issue, it gives responses, which emerged from franchise games and AAN SWG-99. Finally, it offers analysis of implications for the future Army. Chapter Four offers conclusions. Appendix A relates issues identified in this report to themes and issues presented in the

Army After Next FY99 Study and Research Plan. Appendix B identifies salient Army units played in Case A and Case B during AAN SWG-99. Appendix C summarizes important characteristics of Battle Forces played in AAN SWG-99.

AAN EVENTS DURING 1999

This chapter gives an overview of AAN-related events during FY99, including franchise games and the Army After Next SWG-99 series.

FRANCHISE GAMES

During FY99, the Army After Next process included several franchise games, conducted by Army schools and other proponents. Franchise games examined selected issues in greater detail than was possible during AAN SWG-99. Proponents of franchise games held periodic meetings throughout the year to gain information on their areas of focus. When possible, a proponent would hold a game or seminar, which brought together experts and interested parties to share information and insights on its area of specialization. RAND Arroyo Center provided analytic support at franchise games and produced a memorandum presenting findings shortly after the conclusion of each such event. The Arroyo Center provided copies to proponents to assist their analyses and to highlight the important issues that emerged from these games. A brief synopsis of each franchise game follows.

Army Special Operations Forces Wargame

Army Special Operations Forces (ARSOF) Wargame-3 was a seminar, not a wargame. ARSOF Wargame-3 focused on a regional engage-

ment concept and implied capabilities.[1] Blue players were challenged to discuss general questions against the background of a scenario and then brief their conclusions. The players were military officers and civilian personnel with experience in special operations, generally at the operational and tactical levels. They included field-grade officers on active duty and several retired general officers.

The scenario featured an insurgency (Orange) that espoused a fairly sympathetic cause and posed little threat to Blue interests. AAN forces, including Strike Forces and Battle Forces, did not figure in game play, although they were represented in game materials. By design, the game had very little relevance to AAN forces, but it did address broad issues of national strategy. The research questions made no explicit references to AAN forces.

The scenario presented a benign Orange that scarcely threatened Blue interests. As a result, the Blue teams did not contemplate military responses, other than noncombat activities by special operations forces (SOF).

In the context of the ARSOF Wargame-3, regional engagement was an interagency effort under State Department lead with the Defense Department in a supporting role. It included situational awareness, shaping of the environment, and transition to warfighting. The Regional Engagement Force (REF) was a proposed joint organization to plan, control, and execute the regional engagement plan of a regional commander in chief (CINC) at the operational level.[2] The REF was derived from the theater Special Operations Command (SOC), normally commanded by a general officer. If war became unavoidable, the REF eased the transition to warfighting. It promoted interoperability with allied forces, contributed to an initial intelligence picture, targeted key capabilities of the opposing forces, and facilitated the entry of large conventional forces.

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[1]Research Planning, Inc., briefing, "Army After Next ARSOF Wargame-3, Senior Leader Seminar, 23 October 1998," U.S. Army John F. Kennedy Special Warfare Center and School, Fort Bragg, North Carolina.

[2]This depiction of a proposed Regional Engagement Force is drawn from "Regional Engagement: An Army Special Operations Forces Approach to Future Theater Military Operations," prepared by Research Planning Inc., for the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS) in a draft current to October 6, 1998, and from discussion by Blue players during ARSOF Wargame-3.

Army Medical Department Game

The Army Medical Department (AMEDD) franchise was conducted as a one-sided planning exercise. The players were presented with a situation in the form of a vignette from the AAN Spring 1998 Wargame. The role of players was then to decide how medical support would be planned and executed to support the AAN concept of operations.

The game had five objectives:

- Examine the integration of medical support capability into force projection concepts, to include strategic and operational deployment, staging, and sustainment.

- Examine notional operational and organizational concepts needed to provide combat health support to the Battle Force.

- Examine the impact of complex terrain, especially urban combat, on medical support requirements.

- Examine the application of medical technologies to support future Army forces.

- Identify means to increase the fidelity and impact of medical support play on future AAN games. (No specific group of players was given responsibility to achieve this objective.)

The game was clearly focused on the AAN force. Once players were briefed on the force structure and operational concept of the AAN Battle Force, discussions centered on medical support operations.

The game demonstrated the strategic impact that medical operations could have on the success of operational plans, particularly when high casualties could be expected. Players were confronted with several large urban battles that produced large numbers of friendly, enemy, and civilian casualties. Additionally, players discussed various concepts to provide medical support to high-tempo AAN operations that were conducted over large distances. The AMEDD Game highlighted the potential difficulty of providing sufficient medical support to operations in urban terrain where there are large numbers of casualties. The game also indicated that future medical department personnel might require higher levels of training in order to

support AAN-type operations. Finally, several potentially promising medical technologies were identified and discussed.

Information Operations Wargame

The Information Operations (IO) Wargame-3 was a seminar conducted within the context of a scenario. The scenario used for the AAN IO Wargame-3 is the scenario for the FY99 AAN game series. The crisis was set in the Trans-Caucasus/Central Asia region where the Federation of Eurasian States (FES) planned to invade Azerbaijan and Georgia. The United States and its allies had to quickly deploy to the region to eject the invading FES military forces.

Blue and Red players were asked to integrate IO activities into the concept plans (CONPLANs) of their respective CINCs. Both teams had specific tasks to perform that included developing and synchronizing IO actions. The players were military officers, government civilians, industry personnel, and Army contractors, several of whom were retired senior military officers. Most had some expertise in information operations.

Before the game, TRADOC identified three major game objectives designed to support the overall AAN process:

- Determine the IO strategies and plans needed to support future AAN operations.
- Determine how to improve IO processes to support AAN.
- Explore AAN ISR applications in support of IO.

The AAN IO Wargame was focused on producing products—an IO strategy and improved IO processes—which were used in AAN SWG-99. In this respect it differed from previous games in the series, where the emphasis was on surfacing important issues and on gaining insights. Aside from some very general statements of future capabilities, not much was done about understanding future C4ISR architectures. C4ISR was identified as an area where more work was needed.

Space and Missile Defense Game

The AAN Space and Missile Defense Game '99 was jointly sponsored by the U.S. Army Space and Missile Defense Command (SMDC), the National Reconnaissance Office (NRO), and TRADOC. The primary goal of the game was to examine the role of space and missile defense in supporting combat operations in the AAN era around 2020. Game designers identified three major objectives and related research questions for the game to support the overall AAN project objectives for FY99:

- Determine the effect on space operations of supporting land warfare during an extended conflict in 2022.

- Derive insights into conflict termination with regard to space operations and the relationship of ending conflict in space to terminating conflict in terrestrial operations.

- Explore command and control relationships for space and missile defense systems in support of a theater campaign during an extended conflict and conflict termination.

Analysis of game play led to insights in three areas: commercialization of space, national sovereignty in space, and shaping the future battlespace. The future of U.S. military operations in space will depend in large part on commercial space firms. A fundamental problem is to understand the operational implications associated with the rise of transnational commercial space organizations that are likely to dominate future commercial markets. Space poses unique problems in developing a U.S. declaratory sovereignty policy. The difficulty in identifying elements of U.S. ownership of transnational space consortia causes important targeting problems for operations to control space. The multinational ownership of space assets through transnational consortia and the evolving global economic dependence on space assets could make it less likely that any one nation would be willing to wage war in space. While a space war is not precluded, commercial trends in space may contribute to a perception that nations and the global economy have much to lose by initiating warfare there.

AAN SWG-99 SERIES

The Army After Next Spring Wargame-99 series comprised four events: the Force Projection Game, the National Security Seminar (NSS) and Campaign Planning Workshop (CPW), the Pre-Assessment Session on April 12–15, and the Army After Next Spring Wargame-99 on April 26–May 1, 1999.

Each event in this series fed into the next event.

Force Projection Game

The AAN Force Projection Wargame (FPWG) was the first major event in the series. FPWG, set in the Caucasus in the year 2022, had three main goals:

- Produce Time Phased Force Deployment Data (TPFDD) consistent with CONPLANs for the 1999 AAN Spring Wargame.

- Examine force projection and sustainment challenges, and operational concepts of hybrid Army forces.[3]

- Assess how strategic maneuver and intratheater mobility of AAN-era forces would help achieve strategic preclusion.

The requirement to assess the deployment and early entry for two alternative AAN-era forces determined the basic organization of the FPWG. Production of viable TPFDDs to support the two concepts of operations that corresponded to the Case A and B courses of action required two Blue teams. A single Red team developed operational concepts for achieving Red objectives and planned specific military operations.

The game provided insights on the viability of the strategic preclusion concept, but it also raised significant questions. Success requires very rapid deployment of large numbers of U.S. forces. The game showed that success in strategic preclusion depends on having (1) early warning and a prompt decision to act, (2) fast-moving strategic lift systems, (3) favorable geography, access, and host

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[3] "Hybrid" implies varying degrees of modernization, e.g., older Army XXI units, newer Battle Forces.

nation support, and (4) combat capabilities that overmatch opposing forces. The game also revealed the sensitivity of rapid strategic deployment to precursor activities designed to defeat enemy counter-access efforts.

NSS challenged the highest-level players for Blue and Red to review the strategic situation, formulate their national goals, and develop strategies to attain those goals and consider possible threats. The output was guidance to military planners.

CPW allowed military planners at theater level to develop plans, present them to higher authority for review, and revise them in the light of further guidance. At the same time, players who would later participate in AAN SWG-99 had opportunities to become acquainted with game materials and develop working relationships. The output was plans for the employment of forces on theater and joint task force levels, including contingency planning for expected branch points.

The Pre-Assessment Session used Blue and Red war plans to assess roughly a week of hostilities, taking both Blue forces through an early-entry phase up to the point where they could initiate decisive operations. The output was a highly detailed start situation for the SWG.

AAN SWG-99 was a free-play wargame, taking events up to Red defeat in two parallel games. Together with the other events in the AAN SWG-99 series, it raised important issues that will be discussed in Chapter Three.

Scenario. The scenario for this series centered on conflict between the United States with its allies and the FES, characterized as a major military competitor. The FES was a highly aggressive, nationalistic, pan-Slavic state that included Russia, Byelorussia, and the Caucasus. In 2012, the FES conducted a large-scale military incursion into Kazakhstan. As a result, Kazakhstan, Turkmenistan, and Uzbekistan signed mutual defense treaties with the FES, granting it a dominant role. In 2018, the FES executed a swift attack on Maritime Siberia and regained control over this region.

In 2006, the United States initiated the Walker Plan (somewhat comparable to the post–World War II Marshall Plan) to improve eco-

nomic and social conditions in Turkey. Turkey surmounted a wave of Islamic fundamentalism and remained a secular state. In 2010, a second Iran-Iraq War ended with Iranian victory and establishment of the New Independent Republic (NIR), which joined Iraq to Iran. The NIR had hegemonic ambitions in the Persian Gulf while opposing FES expansion in Central Asia. U.S. and international companies invested heavily in development of the oil and gas resources of the Caspian Sea basin. This region emerged as a significant part of the world's energy resources.

The FES had claims to the Transcaucasus based on Czarist and Soviet history. It supported Armenia against Azerbaijan in the quarrel over Nagorno-Karabakh. As a result, Armenia allowed the FES to station an armored brigade on its territory. In strong contrast, Azerbaijan resisted FES political and economic pressure. It welcomed international investment and began exporting oil and gas through Turkey and Georgia, rather than through the FES. Georgia also resisted FES influence. It achieved a rapprochement with Turkey and invited the United States to train its military forces. Frustrated in its drive to regain influence in the Transcaucasus, the FES leadership contemplated a military invasion.

Two Cases Examined. This series examined two cases, distinguished by different Army force structures. (See Appendix B.) In Case A, taking a cautious approach to modernization, the Army created just one Air-Mobile Battle Force (11th AMBF). In Case B, taking an aggressive approach to modernization, the Army created eight Battle Forces: one Air-Mobile Battle Force (11th AMBF), one Light Airborne Battle Force (82nd LABF), one Air Assault Battle Force (101st AABF), three Light Motorized Battle Forces (9th LMBF, 10th LMBF, 25th LMBF), and two Mechanized-Armor Battle Forces (1st MABF, 4th MABF). A larger number of Battle Forces implied a smaller number of Army XXI divisions in the active component (AC). In Case A, the Army had ten AC Army XXI divisions and in Case B the Army had four such divisions. In both cases, the Army had eight divisions in the reserve component (RC) and two divisions that included elements from both AC and RC. In both cases, the Army had four Strike Forces headquarters. Two of these were forward deployed with assigned forces (3rd Strike Force in Korea and 11th Strike Force in Kuwait). As noted earlier, Strike Forces are no longer under consideration by the Army, but they were played at this game prior to the announcement

of the Army Transformation Plan.[4] Forces for sister services, U.S. allies, and opponents were held constant in both cases. The two different Army force structures were not intended to offer alternatives for the future Army. They did, however, allow for a comparison of the capabilities that different levels of modernization might provide.

National Security Seminar/Campaign Planning Workshop

The NSS/CPW put Blue and Red on a road to war and provided war plans to guide the Pre-Assessment Session.

National Security Seminar. The NSS focused on Blue and Red Presidents and their principal civilian and military advisors. The Blue President's advisors included members of a U.S. Cabinet plus the Chairman, Joint Chiefs of Staff, and Commander in Chief, West (CINCWEST), the regional combatant commander. The opposing President presided over officials of the Federation of Eurasian States, hereafter referred to as Red. A third team consisted of the leaders of various coalition countries. This was the Green Team. The NSS culminated in planning guidance for military staffs to develop war plans for the SWG.

Campaign Planning Workshop. The CPW focused on military planning. The Red Commander in Chief, Southwestern Direction (CINCSOUTHWEST) planned for both Case A and Case B. The Blue Commander in Chief, West (CINCWEST) directed campaign planning of Combined Joint Expeditionary Force–Case A (CJEF-A) and Combined Joint Expeditionary Force–Case B (CJEF-B).

Blue envisioned rapidly attaining air superiority and sea control followed by amphibious, airborne, air-mobile, and ground operations

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[4]AAN SWG-99 played slightly different Strike Forces for Case A and Case B. Both were brigade-sized early-entry forces drawn primarily from Army XXI. Both were equipped with the Future Combat Vehicle (FCV) and the Joint Transport Rotorcraft (JTR), but the Case A Strike Force also had the Advanced Robotic Engagement System (ARES), while the Case B Strike Force had current artillery systems. The Case A Strike Force totaled 6,231 personnel, while the Case B Strike Force had 8,006 personnel. This difference in personnel was primarily traceable to infantry strength: the Case A Strike Force had one infantry battalion (844), while the Case B Strike Force had an infantry regiment (2,132). "FY99 Notional Operational Forces and Illustrative How to Fight Concepts and Capabilities," Futures Directorate, TRADOC, document prepared in support of the AAN series, 1999, slides 91–93.

to restore the territorial integrity of Azerbaijan and Georgia. Blue thought that Red movement would be slowed by constrictive terrain (except in southeastern Azerbaijan), Blue air interdiction, and resistance of indigenous forces. Nevertheless, Blue anticipated that Red would seize key objectives in theater before arrival of Blue forces on the ground. Blue hoped to launch a decisive counteroffensive before Red could consolidate its defensive positions. Despite considerable discussion on nuclear weapons during the NSS, Blue planners worked under the NCA-directed assumption that they could inflict a large-scale conventional defeat of Red without Red resorting to nuclear weapons, but during AAN SWG-99 Red did decide to use them. When confronting a nuclear-armed opponent, the NCA should develop as clear an understanding as possible of the circumstances and conditions that would lead the enemy toward a decision to employ nuclear weapons.

Red envisioned an extremely rapid defeat of indigenous forces in Azerbaijan and Georgia coupled with efforts to prevent Blue from projecting combat power into theater. It planned mining of the Black Sea, ambitious special operations against a range of targets, large-scale air attacks against Blue APODs and SPODs, an amphibious assault on the Georgian littoral, and ground advance into Azerbaijan and Georgia. Red hoped to exploit urban terrain to offset Blue advantages in knowledge and speed. Red planners believed that in urban terrain Blue would have greater difficulty finding and killing Red forces, that civilians would serve as shields, and that Blue would be deterred by the risk of casualties.

Pre-Assessment Session

The Pre-Assessment Session adjudicated outcomes up to a time when Blue could begin "decisive operations" in a theater of war. This meant that the Pre-Assessment session was to evaluate the first 7–14 days (the period varied between Cases A and B) when air and sea superiority were being established and the initial entry of Blue ground forces into Georgia and Azerbaijan took place. Decisive operations during AAN SWG-99 would then complete the campaign.

During this session, the Chief of Assessment and Assessment Teams for Case A and Case B developed outcomes for a first game move based on the operational plans generated during the NSS and the

CPW. Pre-Assessment acquainted assessors with their responsibilities, game materials, and evolving situations. It also advanced the game clock to the time when Red and Blue land forces would be decisively engaged, with the intention of focusing AAN SWG-99 on operational aspects of decisive air-land operations.

In both Case A and Case B, the outcomes of the Pre-Assessment were bad for Red. Blue quickly swept Red naval forces from regional waters, while suffering small losses. Blue quickly gained air superiority in theater, although still harassed by Red's cruise missiles. Blue exploited this favorable situation to introduce its light and medium land forces, including a Marine Expeditionary Unit (MEU), Strike Forces, and Battle Forces (limited in Case A to one Air-Mobile Battle Force). At the same time, Blue interdicted Red forces attempting to cross the Caucasus Mountains. Therefore on the first day of game play, Red players would confront defeat unless they could extend or escalate the conflict.

Army After Next Spring 1999 Wargame

AAN SWG-99 was a comprehensive, free-play, two-sided wargame under close direction, which brought operations up to a time when Red would have terminated on terms favorable to Blue. By the end of play at the SWG, Red was at a severe disadvantage but had not capitulated. Additionally, at the end of the game, Blue was confronted with significant logistical challenges. Blue exploited its sea control and air supremacy to rapidly deploy forces into Turkey, then interdict advancing Red forces.

AAN SWG-99 featured two parallel games (Cases A and B), supported by specialized game cells. The highest level was designated "Higher Headquarters" on both sides and included small political staffs (supporting the National Security Advisor for Blue, President for Red) plus military staffs at theater level (supporting CINCWEST for Blue, CINCSOUTHWEST for Red). Its function was to give high-level political-military guidance to the operational-level players. Each "Higher Headquarters" guided the actions of two operational-level actors (CJEF-A and CJEF-B for Blue, Red Ops Teams A and B for Red).

A variety of specialized game cells supported play. The Green Team represented Blue's allies (Australia, Canada, France, Italy, Turkey,

and the United Kingdom). A Yellow Team represented commercial interests in the areas of communications, legal affairs, logistics, manufacturing, navigation, remote sensing, and transportation. Yellow simultaneously contributed to Blue and Red planning processes and provided likely outputs to the assessment process. The Blue National Operations Support Team (NOST) combined three broad functions: provision of military forces to CINCWEST (Forces Command), military support to civilian authority (Department of Justice, Department of Energy, etc.), and national assets (space, reconnaissance special operations, etc.).

White was headed by the Game Director, responsible for efficient conduct of the game and accomplishment of its objectives. He was supported by Facilitators, Assessment Teams, Analysis/Data Collection, and Support Operations. Facilitators assigned to player teams served as interfaces with Game Direction. The Assessment Team contained two subordinate teams, each responsible for one of the two cases. Functional Area Assessors were responsible for assessment in key areas, e.g., space operations, and also supported the Response Cell.

The Information Team comprised a Media Cell for news updates and a Response Cell to field queries from the players and play countries not represented by Green. Most players felt that the Media Cell in the Information Team gave outstanding support to the game. Today, high-level military staffs routinely monitor commercial media and regard it as an important source of information. During the SWG, the World News Network (WNN) was both informative and entertaining, as a real-world network usually is. It spurred the players by giving an aura of realism to the game play.

ISSUES

This chapter presents major issues, framed as research questions related to the themes and objectives set for the AAN process. For each question it gives responses, which emerged from franchise games and the AAN SWG-99 series. Finally, it offers analysis of implications for the future Army. RAND formulated these questions to reflect game play. They are related to themes and issues presented in the *Army After Next FY99 Study and Research Plan* developed by TRADOC (see Appendix A). The topics are generally arranged in order of strategic issues (e.g., coalition warfare, strategic preclusion), followed by issues related to joint operations (e.g., sea control, air superiority, sustainment), and finally issues that are more Army-specific, such as survivability of Battle Forces and Hybrid Force employment.

COALITION WARFARE

Research Questions

How could the United States form coalitions and make them militarily effective? How could the Army make its best contribution?[1]

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[1] This issue relates to the following AAN themes and objectives: "1. Strategic Setting: What new challenges will the strategic environment of 2025 pose for the conduct of military operations and the establishment or sustainment of security alliances? 9. Coalition Operations: a. What essential characteristics and capabilities must AAN forces possess to enable interoperability in combined commands? d. How can coalition forces be most effectively employed with AAN-era forces conducting operations in urban terrain?" U.S. Department of the Army, *Army After Next FY99 Study and Research Plan*, Version 7.1, "Annex A, AAN Themes, Objectives, and Issues Study and

Although prepared to fight alone if necessary, the United States usually fights in an alliance or coalition. Therefore, forming such groups and making them militarily effective are fundamental concerns.

Game Play: Political Aspects of Forming a Coalition

During the National Security Seminar, Blue believed that to oppose Red successfully it would need a strong coalition of willing nations drawn from members of the North Atlantic Treaty Organization (NATO). Politically, Blue had to assure that the other coalition members, who would be the primary beneficiaries of a successful defense of the Transcaucasus, would bear their share of the burden. Militarily, Blue wanted coalition members to commit forces early in a campaign. These forces included Turkish land forces and highly mobile assets of other coalition members, especially carrier-based and land-based attack aircraft and rotary-wing air assault units. Moreover, Blue needed transit and basing rights for its forces.

The Blue President observed that in the real world the United States tends to regard its coalition partners as indispensable for political reasons but marginally useful for military operations. From an operational perspective, the United States tends to treat coalition partners as irritants rather than helpers. He felt that the United States would have to change this attitude if it hoped to develop effective coalitions. Recent U.S. experience seems to support these insights, particularly in the case of "out of area" combat operations in which coalition forces often play a relatively minor role in U.S.-led operations.

Red's provocative prewar actions played into Blue's hands. Prior to hostilities, Red tried to hide attack submarines along sea lanes, infiltrated thousands of SOF into Turkey, and mined coastal waters. This last action clearly betrayed Red's intentions and provoked strong reactions from coalition members. In response, Blue and Turkish naval forces began clearing sea mines. Additionally, Blue deployed *Los Angeles*–class attack submarines into the Black Sea, two aircraft

Research Matrix," Headquarters, U.S. Army Training and Doctrine Command, Fort Monroe, VA, March 1999, hereafter *Study and Research Plan*, Annex A.

carriers into regional waters, and an Air Expeditionary Force (AEF) to Turkey. At the same time, Blue planned confidentially for the early use of a wide range of coalition forces.

Even considering Red's provocative actions, the Blue President was pleasantly surprised when Green immediately and enthusiastically joined an anti-Red coalition. Without prompting, Green presented a list of Green forces available for planning purposes. Turkey, the state most directly threatened by Red retaliation, committed itself to the coalition without reservation. However, there was no person on the Green Team who was specifically charged to play Turkey and, therefore, the game lacked an independent Turkish perspective.

During the NSS, a coalition went to war much more easily and quickly than would be likely in the real world. Would Turkey, which bordered on the Soviet Union for most of the 20th century, go to war to prevent recurrence of a comparable situation, especially considering that Turkey feels no affinity for Azerbaijan and Georgia? Would other coalition members feel sufficiently threatened by events in the Transcaucasus and Black Sea to undertake a major war against a powerful, nuclear-armed opponent? During the NSS, the answers to both questions were resounding, unqualified assents. In the real world, the answers would likely be more problematic.

Game Play: Interoperability of Military Forces

During the SWG, Blue players discerned two broad issues in interoperability: (1) C4ISR and (2) logistics resupply.

C4ISR. Some Blue players thought that allies could not afford required systems and therefore would lag behind the more advanced U.S. forces. As a result, U.S. forces would not share a common picture with coalition forces at the operational and tactical levels and might also have difficulty communicating. Other Blue players were less certain that coalition partners would lag behind. They suggested that coalition partners might eventually acquire comparable capabilities to the United States at much lesser cost by exploiting advances in information technology that will be commercially available. As an example, they pointed to the Global Positioning System (GPS), originally developed for U.S. forces and now accessible through a variety of low-cost commercial systems. In this view, the

United States is absorbing large start-up and development costs that its allies may avoid by delaying their acquisition of like capabilities. Also raised by some players was the issue of the United States sharing sensitive intelligence information with coalition partners, even when the latter are members of NATO.

Logistics resupply. Some players expressed doubt that a system of national responsibility for most classes of supply would have worked as smoothly as represented in the game. At peak, nine nations were operating in the Transcaucasus and Turkey: Australia, United Kingdom, Canada, France, Germany, Italy, Norway, Turkey, and the United States. Some players found it hard to envision how this number of national supply systems could have functioned efficiently during high-tempo operations.

Analysis and Discussion

During the SWG, coalition forces conducted operations, for all intents and purposes, as if they were U.S. forces. Coalition partners simply ratified U.S. strategy and contributed their forces. Differences in C4ISR and logistics support played almost no role.

It is at least doubtful whether a coalition of NATO members, much less NATO itself, would make security commitments in the Caspian Sea region, and the members would probably have divergent views on goals and strategy.[2] Differences in C4ISR and incompatibilities in national logistics systems would also pose problems within a coalition. In all these respects, AAN SWG-99 underplayed the inherent difficulties of coalition warfare. Coalition units were, essentially, under the unqualified control of the U.S. leadership, and were assumed to be capable of arriving in theater and supplying themselves with their own national assets. The level of resolution during AAN SWG-99 was admittedly constrained, thus limiting the ability to examine coalition issues in detail.

If, as seems unlikely, the United States could quickly form a coalition against a major competitor and interoperability would pose little dif-

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[2]For current and near-term outlooks, see Richard Sokolsky and Tanya Charlick-Paley, *NATO and Caspian Security, A Mission Too Far?* Santa Monica, CA: RAND, MR-1074-AF, 1999.

ficulty, there would be several implications for the future Army. First, it would be in the U.S. interest to train and equip non-U.S. forces to the highest possible standard, knowing that they would be the first to engage. Second, non-U.S. forces might substitute for U.S. forces in some roles. In this scenario the presence of large numbers of Turkish heavy units with Army XXI–like capabilities obviated the need for many U.S. heavy forces, particularly in Case B, where there were more of the futuristic units present. If, however, these conditions could not be met, the requirement for U.S. ground forces would increase relative to the inability of coalition forces to perform critical ground force missions.

STRATEGIC PRECLUSION

Research Questions

How might the United States attain strategic preclusion? What are the associated risks and benefits? How could the Army best contribute?[3]

Strategic preclusion is the idea of moving so fast and with such lethality that enemies cannot "set" forces and operate at advantage.[4]

Fully realized, *Strategic Preclusion* requires joint force capabilities and methods that can, upon the NCA decision to use military power, move with such velocity and lethality that they preclude the enemy from establishing his force at an operational advantage against our force build up. Strategic preclusion can be seen as an active form of deterrence achieved by deploying substantial, relent-

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[3]This issue relates to the following AAN themes and objectives: "1. Strategic Setting: c. How does the enemy operational concept challenge U.S. forces? 2. Force Projection: h. What are the most promising approaches for meeting force projection requirements in support of strategic preclusion? 4. Hybrid Force Employment: c. What are the strengths and limitations of the various campaign alternatives considered by the CINC?" *Study and Research Plan*, Annex A.

[4]U.S. Department of the Army, *Knowledge and Speed: Battle Force and the U.S. Army of 2025, The 1998 Annual Report on the Army After Next Project to the Chief of Staff of the Army*, Headquarters, U.S. Army Training and Doctrine Command, Fort Monroe, VA, December, 1998, pp. 5–6 (hereafter, *Knowledge and Speed*, 1998).

less and even decisive force at the right time and place to deny the enemy critical objectives.[5]

The concept of strategic preclusion is closely associated with advanced full dimensional operations (AFDO).

> Advanced Full Dimension Operations: Rapid, simultaneous, continuous, and dynamic application of integrated joint military capability, centered on the complementary and exploitative application of joint interdiction and maneuver, achieves such dominance across all military dimensions that an opponent is unable to set or maintain conditions favorable to accomplishment of his strategic, operational, or tactical goals. This overwhelming situation places an opponent at such a disadvantage that he concedes, disintegrates or is set up for failure in the face of follow on forces or continued decisive operations.[6]

> This synergy of action [Advanced Full Dimensional Operations] precludes an enemy from setting or maintaining conditions favorable to the accomplishment of his strategic, operational, or tactical goals. . . . At a minimum, an early application of AFDO would set up an enemy for failure in the face of follow on forces conducting extended operations aimed at conflict termination.[7]

> Responding comprises both rapid response operations focused on achieving preclusive effects—preventing an enemy from achieving his objectives and arresting escalation—and extended operations that may require more deliberate actions and greater mass, whether from the outset or as a follow on to preclusive actions. While Preclusion [capitalization in original] is initially reactive rather than preemptive, rapid AFDO dramatically changes that paradigm wresting the initiative and overwhelming an enemy and forcing capitulation. Preclusion is not preemption.[8]

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[5]U.S. Department of the Army, "FY99 Joint Strategic Concept, Strategic Preclusion Thru Advanced Full Dimensional Operations," briefing, Futures Directorate, U.S. Army Training and Doctrine Command, Fort Monroe, VA, 1999, Slide 10. A copy of this briefing was contained in U.S. Department of the Army, *Army After Next Spring Wargame '99, Reference Book Volume I (Policy and Forces)*, U.S. Army Training and Doctrine Command, Fort Monroe, VA, 1999.

[6]"A Bolt from the Blue, Advanced Full Dimensional Operations . . . A Concept for Joint Blitzkrieg Warfare in 2022," Handout distributed at AAN SWG-99, p. 2.

[7]Ibid., p. 2.

[8]Ibid., p. 8.

Game Play: Attainment of Strategic Preclusion

Force Projection Game. During the Force Projection Game, players produced Time Phased Force Deployment Data (TPFDD) to support concept plans intended to achieve strategic preclusion. The Assessment Team judged that Blue had been delayed one to three days by Red actions. In Case A, Blue had marginal success in precluding Red occupation of Azerbaijan and Georgia. In Case B, Blue had greater success. The Assessment Team judged that several Battle Forces would be astride main routes and in position near key cities before Red could organize strong defenses. But Red forces attained their initial operational objectives and were prepared to fight the recently arrived Blue forces.

National Security Seminar. During the National Security Seminar, Blue players doubted that they could attain strategic preclusion against Red in this theater, in the sense of denying Red its initial objectives. CINCWEST and his deputy commander in chief (DCINC) estimated that Red forces could seize important objectives, including Tbilisi, which dominated the east-west line of communication (LOC), and the oil-producing regions around Baku within a week. Blue would need more time to deploy forces for a successful campaign, even given the expected prehostility deployments. CINCWEST and his DCINC stated that if they could not achieve strategic preclusion, they saw no reason to commit Blue forces hastily, noting that a hasty commitment might cause losses that would affect public opinion in the coalition states. The Blue Secretary of State concurred with this advice, observing that strategic preclusion might be "too costly."

Pre-Assessment and Spring Wargame. During the Pre-Assessment, Blue ground forces conducted offensive operations into Azerbaijan and Georgia starting on D+6 in Case B, and D+10 in Case A. This was an ambitious timeline, especially given the magnitude of the Red force. One of the reasons for the difference in timing between the two cases was a much more aggressive air operation in Case B, intended to achieve air superiority in a shorter number of days than in Case A. This condition was assessed to have been achieved, but with significantly higher Blue air losses in Case B than in Case A.

The ability of Blue to conduct offensive operations into Azerbaijan and Georgia at such early dates in the campaign was based on the AAN Force Projection Game conducted in February 1999, which

concluded that the early deployment of substantial land forces in eastern Turkey was feasible.[9] Additionally, the efforts of the Blue air and naval forces in the first week of the war helped set conditions for the early introduction of Blue ground units into Azerbaijan and Georgia. Assessment concluded that the self-sustainment capabilities of the Blue ground forces that had arrived in eastern Turkey, combined with host nation assistance from Turkey, would allow offensive operations before the arrival of significant numbers of Blue logistics units. The Force Projection game showed that Blue would have difficulty attaining deployment timelines in both cases. The initial Blue ground offensive operations consisted of Turkish units moving into southwestern Georgia, Marine amphibious forces landing near Poti, and air assault units landing near Tbilisi and Agnan. The concept of strategic preclusion influenced these early offensive uses of ground forces, the intention being to gain positional advantage and disrupt Red's operational plan. Although Red had seized most of its initial objectives in Azerbaijan and Georgia, Red had not yet completed consolidation when Blue ground offensive operations began.

Analysis and Discussion

According to game materials (see above), strategic preclusion implied that U.S. forces would accomplish one or more of these objectives:

- Prevent an enemy from achieving his initial goals.
- Deter an enemy from escalating the conflict.
- Create conditions for an enemy to fail in the end.

RAND Insight: The third criterion tends to make strategic preclusion synonymous with U.S. success. If the United States ultimately succeeded in a conflict, it must have created conditions for the enemy to fail.

Table 3.1 shows how the definition might be applied across a range of U.S. wars.

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[9]See Walter Perry et al., *Assessment of the Army After Next Force Projection Wargame '99,* Santa Monica, CA: RAND, PM-896-A, 1999.

According to the third criterion, the early phases of World War II in the Pacific and the beginning of the Korean War count as "strategic preclusion," although they included the fall of Corregidor and the defeat of Task Force Smith. Operation Desert Shield also qualifies, even though U.S. light forces might have suffered badly had Iraq chosen to invade the Eastern Province of Saudi Arabia early in the campaign.

Table 3.1

Strategic Preclusion in Selected Wars

Civil War (federal government as "friendly")	
1. Prevent an enemy from achieving his initial goals.	No. The Confederacy initially established de facto independence from the federal government.
2. Deter an enemy from escalating the conflict.	No. For example, the Confederacy invaded northern states and conducted commerce raiding.
3. Create conditions for an enemy to fail in the end.	Yes. The federal government defeated Confederate invasions, blockaded the South, averted foreign recognition, and built up its strength.
Spanish-American War	
1. Prevent an enemy from achieving his initial goals.	No. The U.S. failed to prevent brutal suppression of the rebellion in Cuba, which became one cause for the war.
2. Deter an enemy from escalating the conflict.	Yes. However, Spain had no serious escalation options.
3. Create conditions for an enemy to fail in the end.	Yes. U.S. naval forces controlled the sea, isolating Spanish garrisons.
World War II (Pacific Theater)	
1. Prevent an enemy from achieving his initial goals.	No. Japanese forces overran most of Southeast Asia, including the Philippines, inflicting a humiliating defeat.
2. Deter an enemy from escalating the conflict.	No. Japan invaded the United States in the Aleutian Islands.
3. Create conditions for an enemy to fail in the end.	Yes. U.S. naval and Marine forces early set conditions for successful "island hopping."

Table 3.1—continued

Korean War (prior to Chinese intervention)	
1. Prevent an enemy from achieving his initial goals.	Partially. U.S. and South Korean forces prevented North Korean forces from seizing the entire peninsula.
2. Deter an enemy from escalating the conflict.	No. However, the North Koreans' only effective option was infiltration, terrorism, and guerrilla action.
3. Create conditions for an enemy to fail in the end.	Yes. Holding the port of Pusan allowed rapid buildup of overwhelming U.S. force.
Persian Gulf War (Operations Desert Shield and Desert Storm)	
1. Prevent an enemy from achieving his initial goals.	No. Iraqi forces seized Kuwait.
2. Deter an enemy from escalating the conflict.	Uncertain. Saddam Hussein may or may not have intended advance beyond Kuwait.
3. Create conditions for an enemy to fail in the end.	Yes. United States and allies built up overwhelming force in friendly Gulf states.
Kosovo Conflict (Operation Allied Force)	
1. Prevent an enemy from achieving his initial goals.	No. Yugoslav forces initially controlled the province of Kosovo.
2. Deter an enemy from escalating the conflict.	No. Yugoslav forces responded with large-scale "ethnic cleansing."
3. Create conditions for an enemy to fail in the end.	Yes. NATO isolated Yugoslavia and subjected it to ever increasing punishment.

RAND Insight: A better definition of strategic preclusion would read: "The United States and its allies achieve strategic preclusion by deploying capable forces so quickly that an enemy cannot achieve his initial goals or escalate the conflict to his advantage."   If the enemy does achieve his initial goals, U.S. response will take the most advantageous course. In some cases, e.g., Korea in 1950, rapid transition to offensive operations might be most advantageous. In other cases, e.g., the Persian Gulf in 1990–1991, deliberate buildup of overwhelming combat power might be most advantageous.

Early arrival of land forces may be critically important early in a campaign. Thereafter, it may be to U.S. advantage to deliberately build up overwhelming force. The goal should be to make Army forces more readily deployable in strength that would preclude early debacles, such as the loss of the Philippines in April–May 1942 and the humiliating defeats in Korea during June–July 1950.[10] In August 1990, the Army needed rapidly deployable forces that could safely secure the Eastern Province of Saudi Arabia or better yet prevent Iraqi forces from overrunning Kuwait. In March–June 1999, the Army needed rapidly deployable forces that could stop "ethnic cleansing" in Kosovo or at least make air power more effective by threatening invasion. For example, the United States might have deployed several brigades to northern Albania, impelling Yugoslav commanders to either concentrate their forces, increasing their vulnerability to air attacks, or to remain dispersed, risking an invasion they could hardly oppose.

During AAN SWG-99, Blue did not deny Red its initial objectives, but did place Red at a decisive disadvantage, thereby achieving strategic preclusion. Blue attained this success through rapidly establishing sea control and air supremacy; through early employment of coalition forces, especially Turkish land forces; and through Battle Force operations in Case B. There are several alternative ways to develop the required land combat power: forward deploy U.S. land forces during peacetime, deploy U.S. land forces rapidly during crisis and conflict, and use coalition land forces already in or near the theater of operations. In AAN SWG-99 Blue used all three ways, with coalition forces playing a critical role.

Blue and Green players had strategic warning of Red intentions, because Red mined areas of the Black Sea and inserted large numbers of SOF, some of whom were detected. Prior to Red D-day, Blue and Green conducted countermine operations to clear safe passages

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[10]However, lack of such forces was not the only, or even the primary cause for debacles suffered early in the Philippines and Korea. A flawed strategy, that relied more on bluff than preparedness, was primarily responsible for the disastrous defeat of U.S. and Philippine forces on Bataan and Corregidor. Gross underestimation of the North Koreans' military aptitude led to the hasty deployment of Task Force Smith.

through the Black Sea. Blue deployed attack submarines into the Black Sea, one AEF into Turkish airbases, and air defense forces. Beginning on D-day, Red rapidly deployed forces into Azerbaijan and Georgia, seizing the key objectives of Tbilisi and Baku, but Blue forces prevented an amphibious landing in Georgia.

As the game unfolded, coalition land forces played a critical role by delaying Red forces and seizing key terrain. Immediately following the Red invasion, two Turkish corps entered Georgia from the south and engaged Red forces. Turkish forces seized Batumi, defeated a Red attack from the north, and advanced toward the major east-west LOC near Tbilisi. At game's end, Turkish forces were in the city of Tbilisi, helping to open and secure the vital LOC between heavy Blue forces in Georgia and light Blue forces in Azerbaijan. In addition, German, Italian, and Norwegian air assault units, that included large numbers of attack helicopters, were extremely effective in both cases. In Case B, these units were successfully employed against Red forces in the vicinity of Tbilisi, although they suffered heavy casualties.

The concept of strategic preclusion required an early ground offensive, but this aggressive use of the limited ground forces available this early in the campaign was controversial. At the time ground offensive operations were initiated, Blue had barely won air superiority against the Red fighter force, and Red's ground-based air defenses appeared formidable. Additionally, Blue's APODs and SPODs were still under intense cruise missile attack. At this point in the campaign, Red had a significant superiority in numbers of ground forces in Azerbaijan and Georgia, and many of these Red units had already gone into defensive positions when Blue ground offensive operations started. Given the very early start of Blue's counteroffensive, there would have been minimal opportunity for Blue fires to have degraded Red's ground units prior to offensive operations, especially in Case B. The correlation of ground forces was not in Blue's favor at this time in the campaign. For example, on D+6 in Case B, elements of the 82nd LABF (closely followed by a German air assault brigade) landed in the vicinity of Tbilisi. No other allied ground units were anywhere near the city at that point.

Meanwhile, the reinforced Red 12th Corps, consisting of roughly nine maneuver brigades plus supporting artillery, attack helicopters, and surface-to-air missiles (SAMs), was in the vicinity of Tbilisi. When elements of the 82nd LABF and other coalition units landed in this vicinity they faced the prospect of many days of operations before other Blue ground units arrived overland from Turkey or Poti. Whether a U.S. commander (or the political leadership) would have accepted such a risk is questionable. Equally doubtful is the prospect that allied leaders would sanction such bold use of their units. While there are some advantages to conducting operations in the depth of the enemy array, in this case the reality of the situation was that a U.S. and coalition command would have had to be willing to commit heavily outnumbered ground forces into the midst of a powerful opponent, at locations hundreds of kilometers from friendly ground forces with an air bridge as their only means of resupply.

Finally, the timelines of the ground offensive operations into Azerbaijan and Georgia were very ambitious from a force deployment and logistical standpoint. The U.S. ground forces had barely arrived in Turkey when they were committed to offensive operations. Other than the few days of self-sustainment brought with the arriving forces, there would have been very little logistical support in place in Turkey to support early offensive operations. When Army ground forces were first committed in Azerbaijan and Georgia, they had to be supplied by air from recently established logistics bases in Turkey.

The ability to achieve strategic preclusion depends on the situation. In some circumstances the concept may be feasible. In other situations, however, the very rapid introduction of ground forces in the face of a superior enemy would be a highly risky proposition. In that situation a more deliberate campaign would be more advisable. In AAN SWG-99, generous assumptions were made about strategic lift, infrastructure improvements in Turkey, the ability to quickly gain a consensus among allies, and the willingness of U.S. and coalition leaders to commit forces in an offensive mode into a dangerous situation. Given the potential power of the Red force, it is very possible that a coalition would decide to deploy and operate in a more deliberate, cautious manner than occurred during AAN SWG-99.

NUCLEAR-ARMED OPPONENT

Research Questions

How might the United States fight a conventional campaign against a nuclear-armed opponent? How could the Army prepare for theater nuclear war?[11]

During the Cold War, the United States and its allies planned theater-level use of nuclear weapons to avert catastrophic defeat in conventional war, especially on the Central Front in Europe. Similarly, a nuclear-armed opponent might threaten nuclear use or actually use nuclear weapons rather than accept large-scale defeat in conventional war.

Game Play: Planning a Conventional Campaign

During the NSS, Blue planners thought that Red might use or threaten to use its large nuclear forces. These consisted primarily of strategic weapons but also included tactical nuclear weapons as a bolster to relatively weak conventional ground forces. Game materials noted that "Delivery means (artillery, rockets, missiles, and bombs) remain plentiful in the air and ground forces."[12]

The Blue Secretary of State recommended that Blue warn Red that any use of nuclear weapons would elicit a "strong response." The Blue President recalled U.S. policy during the Persian Gulf War, especially the deliberate ambiguity in warnings conveyed to Saddam Hussein, who was known to have chemical weapons and to be developing nuclear weapons. Principal advisors agreed that Blue should not commit itself to any particular course of action in advance, but that it should issue a strong warning to Red not to employ weapons

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[11]This issue relates to the following AAN themes and objectives: "1. Strategic Setting: i. How does possession of WMD by nations and transnational organizations affect U.S. decisions to conduct military operations? 7. Homeland Defense: e. How will proliferation of WMD affect the military role in homeland defense?" *Study and Research Plan*, Annex A.

[12]U.S. Department of the Army, *Army After Next Spring Wargame 1999, Military Forces: Federation of Eurasian States*, Headquarters, U.S. Army Training and Doctrine Command (prepared by Booz-Allen & Hamilton under contract), Fort Monroe, VA, 1999, p. 6.

of mass destruction (WMD). Discussants made little distinction between in-theater and out-of-theater nuclear use, but they thought that Red would probably not use nuclear weapons against the Blue homeland because Blue would retaliate.

Blue planners realized that Red might respond strongly to attacks within its homeland. Therefore, they considered whether to draw a line of maximum penetration into Red territory, for example 48° north latitude as provisionally assumed in contingency planning. It should be noted that this restriction applied to Blue air and SOF operations; no operations inside Red by conventional Blue ground forces were contemplated. After soliciting comment from his principal advisors, the Blue President decided not to draw any line restricting operations in the Red homeland. He thought that such a line could create a sanctuary for Red forces capable of ranging into the theater of operations. But he reserved to himself approval for strikes against the Red capital and Red strategic nuclear weapons sites.

Published guidance for Blue military planners contained a section entitled "General WMD [weapons of mass destruction] Guidance" that dealt only with chemical weapons. But under the heading "Constraints & Conditions/Timing & Thresholds" appeared this statement: "In the event that FES uses WMD, Blue response will not be limited to conventional weapons or theater war objectives."[13] The same section noted that the Blue Secretary of Defense would prepare options for Presidential review.

In prewar planning, Red's political leadership contemplated using nuclear weapons if Red were about to suffer a major conventional defeat. Red leaders believed that nuclear war could be limited to the theater of operations and that a nuclear strike in theater could avert a Red defeat. The Red leadership contemplated nuclear strikes against APODs, SPODs, Blue's naval forces, and Blue's key ground units.

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[13]U.S. Department of the Army, *Army After Next Spring Wargame '99, Blue Situation Update & NCA Guidance*, Headquarters, U.S. Army Training and Doctrine Command (prepared by Booz-Allen & Hamilton under contract), Fort Monroe, VA, 1999, p. 5.

However, the Red campaign plans for Operation Red Destiny made no provision for use of nuclear weapons.[14]

Game Play: Responding to Theater-Level Use

During the SWG, Red quickly found itself at a severe disadvantage. Blue defended successfully against massive Red air and missile strikes. A Turkish corps was advancing into Georgia, and Blue forces were arriving rapidly in theater. Red had two broad alternatives to improve this situation: commit a second strategic echelon of forces, or use nuclear weapons. Red believed that Blue would quickly destroy a second strategic echelon and therefore saw nuclear weapons as its only recourse. Game Direction disallowed nuclear use, because it would have focused the game on nuclear issues at the expense of the research objectives set for AAN SWG-99.

Had Game Direction allowed nuclear use, Blue would have been confronted with an extremely difficult situation. Blue could not escalate conventionally in theater because it was already doing its utmost. If Blue attacked conventionally outside the theater, it would widen the war with unforeseeable consequences. If Blue used nuclear weapons in theater, it would increase the damage to an area it had set out to save from depredation. If Blue used nuclear weapons outside the theater, it might provoke an exchange that would devastate both sides.

To explore the nuclear issue, Game Direction organized a sidebar discussion among high-level Blue players. At the beginning of this discussion, some Blue players were inclined to dismiss Red's nuclear use as the act of a "madman," but by the end of the discussion most seemed to feel that Red's action was not only rational but quite possibly to Red's advantage. During the course of this discussion, Blue players considered a wide range of alternatives, including a pause in military operations to encourage negotiation, conventional escalation in theater, conventional escalation in theater plus deep strikes against Red nuclear delivery means, conventional escalation outside

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[14]In both Cases A and B, Operation Red Destiny was the code name for operational plans to secure key objectives in Azerbaijan and Georgia and to prevent or defeat external intervention.

the theater, theater use of nuclear weapons, and nuclear strikes against the Red homeland. They were torn between aversion to nuclear warfare and unwillingness to let Red profit from its action.

Analysis and Discussion

In a comparable real-world situation, the United States would anticipate possible nuclear use and take great care to avoid it. During the Cuban missile crisis, the United States decided not to invade Cuba, in large part because it thought the Soviets might resort to nuclear weapons. During the last Berlin crisis, the Soviet Union decided to allow U.S. convoys to proceed, presumably because it wished to avoid escalation. During the Korean War, the United States limited its military options (for example, not attacking targets inside China) in part due to the possibility of the Soviet Union employing nuclear weapons in support of its allies. Considering this history, it is doubtful whether the United States would try to conduct a conventional campaign against a major nuclear power in a region contiguous to its homeland. But if it did, there would be important implications.

Before conducting a campaign the United States would have to consider how to deter use of nuclear weapons and how to respond if deterrence failed. It would have to consider the likely effects of nuclear weapons on its allies and on its forces in theater. It would have to consider what nuclear guarantees, if any, to give its allies. It would have to consider how best to protect its forces in theater from the effects of nuclear weapons. U.S. forces deployed in theater would have to take measures to reduce their concentration, survive nuclear use, and recover following a strike. The game highlighted the need to assess under what conditions a nuclear-armed opponent would resort to the use of that class of weapon. Such an assessment could help determine whether attempting to preclude this type of opponent is feasible.

Although Blue players were deeply concerned about possible nuclear use, they did not explore the topic thoroughly. They did not adequately plan for the possibility that Red would try to avert conventional defeat by resorting to nuclear weapons. This failure may simply reflect time pressure on Blue players. In a real-world situation, U.S. decisionmakers would be unlikely to commit U.S. forces against

a nuclear-armed opponent without having decided in advance how they would respond to nuclear use. It is uncertain whether U.S. decisionmakers would believe that a nuclear-armed opponent would allow U.S. forces to attain strategic preclusion before he resorted to nuclear use.

EXPLOITATION OF SPACE

Research Questions

How could the United States degrade an opponent's access to spaced-based intelligence, surveillance, and reconnaissance (ISR)? How will rapid expansion of commercial space assets affect national ability to control space? What are the implications for terrestrial operations?[15]

The United States would want to deny an opponent access to space-based ISR while retaining its own access, but an all-out space war might blind both sides. An all-out space war would usually benefit an opponent, but under some circumstances the United States might benefit. Moreover, the United States and its allies might not be able to control commercial space assets except at the price of disrupting their own economic life.

Game Play: Escalation of Conflict in Space

Space Game. During the Space Game, Red and the Commercial Team both adopted a policy of unconstrained access to space during conflict. Red saw this policy as the best way to keep access to commercial systems. The Commercial Team adopted this policy to assure physical survival of space assets and also to preserve normal contractual relationships, which it hoped to continue despite the conflict. In contrast, Blue wanted to obtain a unilateral advantage in space and tried—with little success—to restrict Red access to com-

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[15]This issue relates to the following AAN themes and objectives: "1. Strategic Setting: a. How do political, economic, social demographic and information situations as they exist in 2022 affect the nature of military responses to the crisis? 2. Force Projection: b. What are the critical information requirements for force projection and entry operations? 4. Hybrid Force Employment: f. How will space-based operations contribute to the conduct of operations in 2020–2025?" *Study and Research Plan,* Annex A.

mercial services, even at the expense of its own access. As a result, the Commercial Team perceived Blue as a bully and Red as a defender of international law.

Also during the Space Game, Blue wanted to know how commercial routing was accomplished so it could assess risk to communications and data that were transmitted commercially. The Commercial Team responded that their companies used optimal routing algorithms for most efficient operation and therefore routing changed frequently. As a result, neither Blue nor Red would normally know what routing was in use at any given time.

Spring Wargame. During the SWG, both Blue and Red forces supported their operations through space-based ISR, but the relative importance of space-based assets varied over time. Initially, Red avoided offensive operations in space because its space-based assets were vulnerable and critically needed to observe Blue's deployments into theater. But after Blue forces reached theater, Red could observe Blue forces using ground and aerial systems, so that space-based systems became less important to Red. For Blue, the situations were reversed. During deployment, Blue had relatively less need for space-based systems, but they became crucial during operations in theater. Given Blue's greater capacity to reconstitute military space assets, Blue might better have opted to initiate space war earlier rather than allow Red to initiate it later.

Blue enjoyed a substantial advantage in military space-based assets. However, Red had enough military assets to satisfy its basic needs as well as access to commercial satellite services. Blue undertook several efforts to degrade Red's space-based ISR. It used dazzlers in theater to degrade Red's military system and tried unsuccessfully to persuade commercial corporations that they should delay transmission of space-derived products to Red by 24 hours.

In move 3, Red employed direct ascent anti-satellite weapons and ground-based lasers (GBL) against Blue space-based lasers (SBL). Red hoped to inflict enough damage on the SBLs to allow Red to launch ICBMs and its space plane. Red ICBMs were to attack AEF operating bases and storage sites in theater. The Red space plane was to attack high-value targets in Europe and the CONUS. Red had only limited success against the Blue space-based laser, and Red

attacks on terrestrial facilities caused only marginal degradation to Blue capabilities. In response, Blue destroyed most of Red's military satellites.

Analysis and Discussion

If an opponent's military systems were lost, he might still satisfy some of his ISR needs through access to commercial services. It is unclear how the United States and its allies could deny an opponent access to commercial service without severely limiting its own access. Moreover, uninterrupted service might be vital to economic life. In view of these difficulties, an opponent might have at least some access to commercial systems during a conventional military campaign.

The implication for all military services is that information dominance could be incomplete due to commercial access by an opponent. However, the United States could degrade and distort this access by spoofing and jamming on a theaterwide basis.

SEA CONTROL

Research Questions

How quickly and completely could U.S. and coalition forces gain sea control against a major competitor? How would sea control affect operations in theater?[16]

The United States is accustomed to operating freely throughout the world's oceans. But in some future conflict, the United States might need to gain sea control very rapidly in constricted waters against an opponent with modern weapons. For example, the United States arbitrarily restricted its operations in the northern Persian Gulf during Operation Desert Shield and suffered damage to sea mines later.

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[16]This issue relates to the following AAN theme and objective: "8. Joint Operations/Interdependence: a. What tasks will the Army depend on other services or governmental organizations to perform?" *Study and Research Plan*, Annex A.

Game Play: Battle of the Black Sea

Prior to D-day, Blue aircraft carriers had not passed the Turkish Straits, but Blue had six *Los Angeles*–class attack submarines in the Black Sea when Red began its attack. In a three-day Battle of the Black Sea, Blue gained almost complete sea control over Red. Between H-hour and H-hour+6, Blue attack submarines largely destroyed a Red surface action group (SAG) and a separate Red amphibious task force bound for Poti. They quickly sank four *Moskva*-class cruisers, three *Soveremeny*-class destroyers, five amphibious assault ships, and two support ships. They left one *Tbilisi*-class carrier and one *Kirov*-class cruiser dead in the water. Only a few smaller vessels escaped because they were in water too shallow for effective torpedo attack.

During the first two days of combat, Blue B-2 bombers and Naval Tactical Missiles (N-TACMs) also sank ten Red XXI Century–class frigates in the Sea of Azov.[17] These frigates each fired about 1,700 rounds through their railguns against targets in northern and eastern Turkey before being destroyed.

Game Play: Impact of Sea Control

Control of the Black Sea allowed Blue to extend its defense of Turkish air space, to eliminate Red sea-based systems capable of firing into Turkey, to prevent a Red amphibious assault on the Georgian littoral, to protect its sea lines of communication (SLOCs), and to conduct its own amphibious assault.

Blue used the Aegis system and carrier-based combat air patrols to strengthen its defense of APODs and SPODs in Turkey. Blue submarines completely defeated a Red attempt to land naval infantry near Poti. Blue naval forces supported forced entry and arrival of follow-on forces through an assault north of Poti and the seizure of

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[17]The XXI Century–class frigate was a notional general-purpose vessel equipped with anti-ship missiles, anti-submarine weapons, and several guns. Each mounted one railgun that could deliver a 150-pound GPS-guided projectile up to 400 nautical miles at a rate of six rounds per minute. U.S. Department of the Army, *Army After Next Spring Wargame 1999, Foreign Systems: Federation of Eurasian States*, Headquarters, U.S. Army Training and Doctrine Command (prepared by Booz-Allen & Hamilton under contract), Fort Monroe, VA, 1999, p. 23.

Batumi. As the campaign progressed, Blue naval forces provided sea-based fires in support of operations on the Georgian littoral and continued to protect the deployment of forces from east coast U.S. ports all the way to the area of operations.

Fundamental to naval play in the game was the assumption that the U.S. Navy would be willing and able to send large numbers of its ships and submarines, including amphibious ships carrying thousands of troops, into the constricted waters of the Black Sea. In addition, assessors assumed that Red would have little capability to protect its surface ships and shore bases. For example, the rapid destruction of Red's XXI Century frigates in the Sea of Azov was largely due to a relatively small number of missiles launched from the Blue attack submarines in the Black Sea. No missile defenses of the Red Azov base were played, nor were Red's ships credited with point defense capabilities.

Failure to quickly gain control of the Black Sea would have had a very significant impact on the campaign because Blue and Green forces and supplies flowed into the theater via Black Sea ports, and Blue naval forces made significant contributions to the tactical missile defense (TMD) and interdiction of Red forces.

Analysis and Discussion

Game play may have made sea control appear unrealistically easy. In a real-world situation, the U.S. Navy might well hesitate to deploy large surface forces quickly through the Turkish Straits and into the Black Sea against a major power with modern air and sea forces. Game play may also have underestimated the difficulty of launching a large-scale amphibious assault at short notice. It appears more plausible that U.S. attack submarines could quickly destroy opposing surface vessels, even within enemy territorial waters. It is interesting to note that in SWG-98 a far less capable opponent had at least as much, if not more, success in disrupting Blue naval operations.

Game results underscored the critical importance of early sea control, especially in littoral warfare. Littoral warfare is of primary interest to the Marine Corps, but the Army is also interested. For example, light Army forces might operate again from an aircraft carrier as during the September 1994 intervention in Haiti.

AIR SUPERIORITY

Research Questions

How quickly and completely could U.S. and coalition forces attain air superiority against a major competitor? How would air superiority affect operations in theater? How could the Army best contribute to air superiority?[18]

Air superiority is a complex mission that entails operations against manned aircraft, ballistic missiles, cruise missiles, and air defenses. The United States and its allies will probably continue to enjoy a great advantage in all aspects of manned flight. Ballistic missiles, cruise missiles, and air defenses, especially low-level passive defenses, could pose greater challenges to allied air superiority.

Game Play: Establishing Air Superiority

Blue urgently needed to attain air superiority over Turkey to shield APODs and SPODs, which it required to build up decisive force in the theater. Within a week to ten days, Blue needed air superiority over the Black Sea and the Transcaucasus to interdict the advance of Red forces and to support its own offensive operations.

At the outset of hostilities, Blue had two aircraft carriers and one AEF plus point air defenses in theater and Turkish air forces. Red had a large, modernized air force, but it was hopelessly outclassed by Blue and therefore largely ineffective.

Red used every available means to attack Blue's APODs and SPODs, including special operations forces, fixed-wing aircraft, medium-range ballistic missiles, cruise missiles, chemical weapons, long-range naval gunfire (railguns fired from XXI Frigates in the Sea of Azov), information operations, and conventionally armed ICBMs launched from Red's homeland.

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[18]This issue relates to the following AAN themes and objectives: "2. Force Projection: How can critical force projection assets be protected?   8. Joint Operations/Interdependence: a. What tasks will the Army depend on other services or governmental organizations to perform? b. What interdependencies and/or redundancies must be maintained?" *Study and Research Plan,* Annex A.

Where Blue had deployed ballistic missile defenses, it destroyed almost all incoming Red missiles. Blue was more vulnerable to cruise missiles. At the outset of the campaign, Red had very large numbers of cruise missiles, enough to sustain massive attacks on APODs and SPODs for several weeks. Red's bomber-launched missiles had ranges up to 3,200 kilometers and flew 15 meters above sea level as they approached the northern Turkish coast.

As a result of Red attacks, Assessment delayed the flow of Blue forces by two or three days and caused Blue to experience some supply shortages. From the Red perspective, this outcome was simply a defeat of Red's efforts to deny entry into the theater. In accordance with Red planning, Assessment decided that Red would employ chemical weapons about a week into the campaign, causing reduced sortie rates from some bases and a brief delay to arriving Blue forces. But despite these delays, Blue rapidly introduced three more AEFs and extended its air superiority to the Transcaucasus.

Red had large numbers of modern SAMs assigned from brigade-level through Strategic Direction (the Red equivalent of a regional combatant command), but these caused few Blue losses. Exploiting air superiority, Blue inflicted significant losses on Red ground forces advancing in columns through the Caucasus Mountains and supported early entry of Blue ground forces on the Georgian littoral and in southwestern Azerbaijan.

Red took special precautions against air operations of Blue Battle Forces. It deployed teams with man-portable air defense missiles and employed anti-helicopter mines to destroy Blue's super short takeoff and landing (SSTOL) aircraft and JTR. At first, these measures had little effect, but by game's end Assessment credited Red with destroying significant numbers of these aircraft.

Game Play: Countering Cruise Missiles

During the SWG, cruise missiles constituted Red's most significant challenge to Blue air superiority. Red had a total inventory of about 20,000 fairly accurate, long-range cruise missiles. Red preferred to deliver cruise missiles by bombers flying outside the range of Blue's ground- and sea-based air defenses and beyond the patrol range of Blue's sea- and land-based fighters. On the first day of the campaign,

Red fired roughly 1,000 cruise missiles against ports, airfields, air defense sites, and key command and control nodes in Turkey, Azerbaijan, and Georgia. Red was credited with being able to sustain a rate of approximately 500 cruise missile launches per day well into the second week of the war. Although Blue's defenses shot down 85–95 percent of incoming missiles, sufficient numbers leaked to inflict damage on several seaports and airfields.

Due to the cruise missile threat, AEF 3 and AEF 4 were initially diverted to Greece and Italy, reducing their sortie rates, while incoming transport aircraft had to land in western Turkey. In Case B, Red focused its ISR capability on locating the 101st Air Assault Battle Force (AABF). After locating the 101st AABF's assembly areas, Red launched a cruise missile barrage, which destroyed some 60 JTRs on the ground. Blue responded by expanding its air defense umbrella across the Black Sea, reinforcing its point defenses of key locations, flying additional combat air patrols, and attacking bomber bases in the Red homeland. The overall effects of Red's cruise missile capability were to degrade Blue air operations, delay the arrival of follow-on forces, and, to a lesser extent, threaten some Battle Forces. Cruise missile attacks continued up to the end of the game, although in reduced numbers.

The effort required to suppress Red surface-to-air missile units was not adequately addressed in the game. Red was credited with numerous brigades of SA-10, -12, and -15 SAMs, all upgraded to 2020 standards. The number of SAM brigades deployed to Red's Southwest Strategic Direction would have resulted in very dense air defense coverage. All the SAMs listed here include anti-missile capability in addition to their ability to engage aircraft.[19]

Analysis and Discussion

Air superiority implies dominating every means of affecting combat outcomes through aerial vehicles.[20] Assuming that current pro-

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[19]See U.S. Army Training and Doctrine Command reference booklet, *Army After Next Spring Wargame-99, Military Force: Federation of Eurasian States.*

[20]The U.S. Air Force defines air and space superiority as "control over what moves through air and space" and observes that "Defense against ballistic and cruise missiles

grams, including the F-22, reach fruition, even major competitors will be unable to contest air superiority against the United States in aircraft-on-aircraft engagements. As a result, potential opponents may shift their emphasis to ballistic and cruise missiles. Cruise missiles currently are expensive and therefore limited in numbers, even for U.S. forces. But progress in microprocessing might reduce cost so that a major competitor could afford to acquire thousands of advanced missiles, thus posing a significant threat against deploying U.S. forces. To counter this threat, the United States and its allies would probably require a mixture of offensive and defensive measures. They would have to suppress and destroy opposing cruise missile carriers. They would have to maintain integrated, layered air defense umbrellas incorporating air-to-air and surface-to-air systems. Terrestrial point targets might require terminal defenses comparable to those deployed on naval vessels.

The number of cruise missiles that Red was credited with was a point of some discussion at the game. Some participants contended that 20,000 cruise missiles was too large a number. That number was based on an assumption by the designers of the Red forces that the cost of cruise missile technology would come down in the future. In any case, the effectiveness of Blue TMD was assessed at such a high level that the potential effect of the large Red cruise missile inventory was dramatically reduced.

Game play may have underestimated the time and resources required to suppress modern air defenses, especially nonemitting systems capable of engaging aircraft at low to middle altitudes. Even so, losses of SSTOL and JTR were large enough to merit further investigation. To operate successfully within the envelope of opposing air defenses, the Army would have to develop ways of suppressing or evading these air defenses. Currently, U.S. forces can reduce the effectiveness of emitting systems through electronic countermeasures and destroy or suppress radars by anti-radiation missiles, but they remain vulnerable to nonemitting low-level air defense

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is an increasingly important element of air and space superiority." Sheila E. Widnall, Secretary of the Air Force, and General Ronald R. Fogleman, Air Force Chief of Staff, *Global Engagement, a Vision for the 21st Century Air Force*, U.S. Department of the Air Force, Washington, D.C., 1997, unpaginated.

systems, including air defense artillery and missiles with passive seekers and anti-helicopter mines.

SUSTAINMENT

Research Questions

How can the United States assure sustainment of forces in a quickly developed theater? What sustainment concepts would be optimal for Battle Forces?[21]

In some future conflict, the United States might have to enter a contested, relatively undeveloped theater with constrained logistics support. Sustainment might be especially difficult for land forces operating in considerable depths and at high tempos.

Game Play: Sustaining Joint Forces in Theater

During the SWG, Blue had to deploy forces long distances from the continental United States (CONUS). As these forces arrived in theater, Blue had to sustain them by airlift and sealift at the end of very long lines of communication. Timely sustainment was critical to maintaining the high operational tempo required to retain the initiative and to attain strategic preclusion. Red had much shorter distances to overcome but was vulnerable to interdiction, especially in the narrow passes through the Caucasus Mountains and coastal roads along the Black Sea and Caspian Sea littorals. Red realized that it would be at a disadvantage if Blue could deploy and sustain large forces in theater. Therefore, Red conducted an all-out attempt to keep the Blue forces out of theater, concentrating on APODs and SPODs in Turkey.

Red used every means at its disposal to delay the arrival of Blue forces, including

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[21]This issue relates to the following AAN theme and objectives: "3. Sustainment: b. How do various logistic concepts to include swarms, caches, and robotic forces impact military operations? e. What are the sustainment challenges with AAN-era hybrid force entry operations? i. What are the implications of emerging medical organizational and operational concepts on seamless integration of health support?" *Study and Research Plan*, Annex A.

- Sea mines in the Black Sea prior to D-day
- Submarine attacks in the Atlantic and Mediterranean
- Information operations (IO) in CONUS
- Attacks on APODs, SPODs, and petroleum stocks in Turkey
- Special operations
- Long range naval fires—XXI Frigates with railguns
- Air-launched cruise missiles
- Ballistic missiles
- Lethal chemical weapons
- Electromagnetic pulse (EMP) weapons.

Blue conducted countermine operations prior to D-day and as a result suffered no significant damage to sea mines. Red submarines sank several ships and Red IO in CONUS caused some delay in U.S. deployments. Red caused the greatest delay and disruption through its relentless attacks on Blue APODs, SPODs, and petroleum stocks throughout the theater. Red realized that Blue operations would require massive logistical support throughout the area of operations, particularly aviation fuel for the large numbers of SSTOL aircraft, JTRs, and attack helicopters. Consequently, Red focused its attacks on Blue's sustainment operations. By move 3, a shortage of fuel compelled CJEF-B to pause operationally.

Game Play: Sustaining Battle Forces in Combat

During the SWG, Blue CJEF commanders initiated offensive operations on land as soon as air superiority was achieved. Battle Forces soon operated far forward of their logistical bases. The most difficult resupply problem was fuel, especially fuel for the aircraft supporting Battle Forces. Even assuming that sufficient stocks were available in Turkey, distribution problems slowed the tempo of operations.

Battle Forces were assumed to be self-sustaining for 48–72 hours of independent operation, apart from aviation fuel. After this time expired, Battle Forces had to either be resupplied in place or rotate out of the battle area. Moreover, Battle Forces have minimal organic

logistical support. Therefore, keeping these forces resupplied presents great challenges. Conceptually, Battle Forces would rotate through forward resupply points, for example in a scheme that kept four Battle Units available for combat while two Battle Units engaged in resupply. However, the game did not have enough granularity to test this concept.[22]

Analysis and Discussion

In all likelihood, future Army forces will still depend on logistical support delivered through APODs and SPODs, which could be vulnerable to air attack, special operations, and terrorism. Against such opposition, the United States would require an effective theater missile defense, a difficult technical problem to solve.

Chemical weapons would also pose significant challenges. Even well-trained military units might be severely affected, and civilian workers, including some indispensable to base operations, might be incapacitated or take flight. To counter this threat, the United States and its allies would have to mount a comprehensive defense that embraced not only military units but also the civilian work force.

Battle Forces have a notional tempo of operations significantly faster than current Army forces and farther from their support bases. Sustaining these operations poses enormous challenges, especially if an enemy has air defense weapons that could threaten aerial resupply. Rotation of Battle Forces for resupply appears impractical, but it is not clear what alternative concepts should be pursued.

Given the limited ability to assess logistics details during the game, sustainment issues tend to focus on bulk consumables such as fuel and ammunition. In actual operations the rapid availability of critical low-density spares could have a significant influence on operations. Certain medical supplies such as blood may have a similar effect.

In general, the AAN force appeared to be operating on the edge of sustainability. Even given the generous lift and host nation assump-

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[22] Headquarters, U.S. Army Training and Doctrine Command, *Evolving CSS Battle Force Support Concepts, Focusing on the 21st Century,* Fort Monroe, Virginia, 1999.

tions that permitted very early initiation of ground offensive operations, the forces eventually reached their logistics culminating point and had to dramatically reduce their tempo.

URBAN TERRAIN

Research Questions

How might U.S. and coalition forces operate in urban and complex terrain? How could the Army best contribute to operations in urban terrain? What roles should Battle Forces have?[23]

This issue emerged in earlier AAN games when Red forces evaded Battle Forces by rushing into urban terrain. Based on this wargaming, TRADOC identified these options for handling urban terrain:

Option 1: Preempt or deny enemy occupation.

Option 2: Bypass the urban area.

Option 3: Contain but not destroy the enemy within the city.

Option 4: Reduce enemy forces by standoff strikes, if collateral damage is acceptable.

Option 5: Seize the area using U.S. and allied forces.[24]

Game Play: Situations Involving Urban Terrain

During the SWG, Blue players were confronted with several situations that involved urban areas. In each case, the CJEF commander made an operational decision he considered appropriate to the situation.

Some Red forces remained in Poti, a Black Sea port that Blue originally intended to seize and use as an SPOD. Rather than accept ur-

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[23]This issue relates to the following AAN theme and objectives: "5. Urban/Complex Terrain: a. What are the critical limitations and vulnerabilities associated with employment of AAN-era forces in large urban areas? b. What operational concepts, organizations, and capabilities should be used during the employment of AAN-era forces in large urban areas?" *Study and Research Plan*, Annex A.

[24]*Knowledge and Speed*, 1998, p. 19.

ban combat, Blue bypassed Poti and seized Batumi instead (Option 1).

Red forces withdrew into Tbilisi, a city that dominated the east-west LOC through the Transcaucasus. Both Blue CJEFs needed this LOC to link their heavier forces in the west with light and medium-armored forces in the east. These lighter forces were supplied almost to game's end solely through an air bridge that Red was assessed as being unable to disrupt. Blue, however, avoided protracted urban combat in Tbilisi. Instead, Blue employed U.S. and Turkish forces to seize just that part of the city, generally south of the Kur River, needed to establish a LOC (Option 2 or Option 3, modified).

In both Case A and Case B, Blue commanders cleared parts of Tbilisi during the last move with relative ease, even though the Red 12th Corps had ample time to consolidate its position in this city. Moreover, the Red 12th Corps was one of the strongest in the Red order of battle and included units specialized in urban combat. In the real world, operations of this kind might be significantly more difficult.

Larger and more combat effective Red forces remained in Baku, the Baku peninsula, and offshore oil facilities near Baku. In Case A, Blue SOF recovered most of these oil facilities. The commander of CJEF-A cancelled planned airdrops in the Baku area when reconnaissance revealed that they were too risky. In Case B, Red forces began to destroy as many oil facilities as they could. In both cases, Blue forces contained Red forces in Baku (Option 3).

Game Play: Requirements for Urban Operations

AMEDD Game. During the AMEDD Game, the panel noted that in urban operations there would probably be casualties caused by eye wounds, inhalation, electrical shock, and ricochets, as well as stress-related problems. The panel thought that challenges would include preparing first response, locating casualties, extracting casualties from rubble, and conducting casualty evacuation. It recommended development of new technologies to solve problems of extracting and evacuating casualties. The panel also noted that urban combat could produce noncombatant casualties in large numbers. A theater commander would have to respond to such a disaster by integrating his own efforts with a larger international response, which would

include efforts by coalition partners and other concerned countries, international organizations, and nongovernmental organizations.

Spring Wargame. The game suggested that almost any unit might suddenly be forced to conduct operations in urban terrain. The LMBF, the only Battle Force optimized for urban combat,[25] was not employed because it had not reached key urban areas before game's end. When urban operations were required, units in the immediate vicinity were tasked to perform the mission. Based on this result, the Army should consider preparing all its early arriving forces to conduct urban operations if required.

Analysis and Discussion

In contrast to previous years, Battle Forces were designed as combined arms formations capable of operating in all types of terrain. However, they were optimized for rapid operational maneuver, and players therefore preferred to employ other forces, especially heavier forces in urban terrain. The exception is the LMBF, which is optimized for urban operations, but it was not employed in this way during the SWG. By contrast, coalition forces with U.S. support might be highly effective in urban terrain. Players thought that operational commanders should consider alternatives to urban combat but undertake them when required by the military situation or directed by higher authority for political reasons, such as recovery of an allied capital.

RAND Insight: Vertical maneuver would be very risky or infeasible against an opponent employing low-altitude air defense systems, especially man-portable missile systems, in urban terrain. Combat vehicles vulnerable to man-portable anti-tank weapons would have

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[25]The Light Motorized Battle Force was a "niche enabling force for complex terrain" able to conduct "operations over large urban areas, in mountains and jungles and over areas of mixed terrain." U.S. Department of the Army, *Army After Next Spring Wargame '99, FY99 Notional Operational Forces and Illustrative How to Fight Concepts and Capabilities,* U.S. Army Training and Doctrine Command, Fort Monroe, VA, 1999, Slide 9. It was an 11,200-man force built around six 1,084-man infantry regiments, each having 13 Armored Scout Vehicles and 48 Advanced Combat Vehicles (ACV). ACV were an armored family of vehicles with combat weights of approximately 8 tons. The combat version was armed with 30mm guns and miniaturized line-of-sight/non-line-of-sight missiles. It carried a crew of two plus nine infantrymen.

very limited utility. Long-range precision fires would encounter severe problems of masking.

It should be noted that enemy actions and political mandates could require a difficult urban fight by U.S. forces. For example, in this scenario Baku and Tbilisi had great political significance. This could have led to politically motivated requirements to engage in urban operations. This highlights the need for a comprehensive joint approach to the strategic, operational, and tactical issues associated with urban operations.

REFUGEES DURING CONFLICT

Research Question

How could the United States and its allies cope with massive flows of refugees during conflict?[26]

During World War II and the Korean War, U.S. and allied forces often had to cope with large flows of refugees. Indeed, several of today's foremost humanitarian agencies, such as the United Nations High Commissioner for Refugees (UNHCR), are a response to conditions created by World War II. Recently, the United States has addressed problems of refugees in such places as Somalia, Rwanda, Bosnia, and countries bordering Kosovo. Since the Korean War, however, the United States has not had to conduct large ground combat operations while simultaneously handling problems posed by refugees. In the recent Kosovo crisis, for example, refugees fled the province during an air operation and largely returned home when ground operations began. But some future contingency might pose both requirements simultaneously.

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[26]This issue relates to the following AAN themes and objectives: "1. Strategic Setting: b. What are U.S. vulnerabilities (military and civilian) to asymmetric threats during all phases of military operations, in theater and external to the theater? 9. Coalition Operations: c. What are the tasks that the military depends on civilian and coalition organizations to perform in response to this crisis? e. What tasks is the Army expected to perform for civilian and coalition partners in this crisis?" *Study and Research Plan,* Annex A.

Game Play: Massive Outpouring of Refugees

Red's invasion of Azerbaijan and Georgia provoked a massive out-pouring of refugees. The operational area included several large urban areas, particularly Tbilisi and Baku, where fighting would likely displace people. Moreover, Red deliberately displaced civilians in the expectation of hampering Blue operations. Refugees quickly clogged the region's limited road net and caused a massive humanitarian emergency. Blue had to respond to this emergency while still involved in combat operations against Red.

Initially, Blue players tended to see refugees as a distraction from their combat mission. But by the final game move, CINCWEST realized that he had to solve the refugee problem for both moral and operational reasons. Morally, Blue could not ignore the plight of thousands of civilians uprooted by a war Blue was fighting out of geopolitical calculations. Operationally, Blue had to assure that roads and other transportation infrastructure remained available for military use.

CINCWEST promulgated the following guidance on refugees: The CJEF commanders would not divert forces from combat missions to aid refugees. They would help create safe areas for refugees in the areas of Poti, Lenkoran, and Goradiz. They would assign coalition assets to humanitarian missions whenever possible and coordinate efforts with international organizations, nongovernmental organizations (NGOs), and the Azerbaijan and Georgian governments in exile. The CJEF commanders found that they had very limited capability to support humanitarian assistance. Therefore, they adjusted Time Phased Force Deployment Data (TPFDD) for the final phase of the campaign to include more civil affairs (CA) assets and additional combat service support (CSS) units.

Game Play: Impact on Operations

The magnitude of the refugee problem hampered Blue operations. Initial deployment of Blue forces was heavily biased toward combat units. As a result, support units were in short supply, and the CJEF commanders initially lacked resources to address the refugee problem.

By game's end, there were some 200,000 refugees in the Poti-Batumi area alone. In the entire area of operations the refugee count would presumably have been much higher. Additionally, many of the refugees had been subjected to Red's use of biological agents, resulting in widespread illness among the huge numbers of displaced persons. Blue had to assist refugees while it was simultaneously conducting combat operations. Moreover, the problem became acute just when Blue's own logistics structure was strained by the high tempo of operations. Coordination was difficult due to the large number of organizations involved in relief efforts, including allied nations, host nations, international organizations, and NGOs.

Analysis and Discussion

If current trends continue, the world's population will become larger and more heavily concentrated in urban areas. Future combat operations conducted near heavily populated areas may generate large numbers of refugees, who will impede military operations and require humanitarian assistance. Requirements for assistance may drain military resources, particularly in areas close to combat zones, where civilian relief agencies are not yet established. All services may be affected, but especially the Army, which might have to operate intermingled with refugees. To solve this problem, the Army will need to develop its own first response plans and methods of handing off quickly to civilian relief agencies.

AIR MOBILITY OF BATTLE FORCES

Research Questions

How might a future Objective Force achieve air mobility? How could the United States reduce the vulnerability of SSTOL aircraft and JTR? How should SSTOL aircraft be allocated?[27]

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[27]This issue relates to the following AAN theme and objectives: "4. Hybrid Force Employment: i. Which air delivery means (STOL, SSTOL, VTOL) provides significant increases in vertical envelopment capability of middle weight forces? q. What are the survivability implications of the theater air transport alternatives for the FY99 AAN notional battle forces (C-130, SSTOL, JTR)?" *Study and Research Plan*, Annex A.

In Operation Allied Force in Kosovo, the United States almost always flew above the effective ranges of anti-aircraft artillery and man-portable missiles. But to realize the AAN FY99 Battle Force concept, supporting aircraft would have to fly within range of such systems, making their survivability an issue. If the Army develops forces to exploit SSTOL assets maintained by a sister service and centrally controlled, allocation of these assets would become an issue.

Game Play: Vulnerability of SSTOL and JTR

In AAN SWG-99, Blue inserted Battle Forces using Air Force SSTOLs and Army JTRs. Allied air assault units self-deployed using organic rotary-wing aircraft. Even after Red fixed-wing aircraft had been driven north of the Caucasus, Red could still disrupt SSTOL and JTR operations using land-based air defense systems and special-purpose mines. On several occasions, Red inflicted large losses to JTRs and SSTOLs through low-altitude air defenses. On one occasion, Red conducted a massive cruise missile strike on assembly areas of the 101st AABF, causing significant casualties.

Game Play: Allocating Airlift Sorties

The Air-Mobile Battle Force (AMBF) was deployed differently in Case A and Case B due to decisions about allocation of SSTOLs.[28]

In Case A, the AMBF deployed from CONUS on USAF SSTOLs dedicated to that mission. As a result, the AMBF was available for an air assault into Agnan early in the campaign. But in Case B, Assessors decided that SSTOL-equipped wings would have to carry their own support equipment into Turkey on their first sorties and that they could not be used to lift Army forces until their support was in theater. Therefore, in Case B the AMBF had to deploy to Turkey aboard fast ships. Once it arrived in theater, SSTOL aircraft gave it an air assault capability.

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[28]The Advanced Theater Transport (ATT) was an SSTOL transport aircraft capable of combat delivery of a 30-ton payload into austere landing sites. It required at least 750 feet of runway.

In Case B, the 101st AABF conducted an air assault into Agnan. Its mission was to defeat the heavy Red 8th Corps, which was in defensive positions around Agnan. The 101st AABF, together with elements of the 82nd Light Airborne Battle Force (LABF), accomplished this mission but suffered approximately 25 percent casualties.

Analysis and Discussion

When airborne in forward areas at low altitude, SSTOL and JTR are vulnerable to ground-based air defenses. When on the ground, they are vulnerable to attack by ballistic and cruise missiles. It is technically infeasible to give these aircraft stealth characteristics, and arming them would have significant drawbacks. They might be provided with escorts, electronic countermeasures (ECM), and self-defense systems such as those used in current special operations aircraft. The Army and Air Force might also develop joint tactical doctrine to reduce the vulnerability of these aircraft, for example by providing appropriate escort and sweeping their landing zones with fire. Within continuing study and gaming efforts, TRADOC should sponsor more detailed assessment of insertion tactics.[29]

The AMBF concept required strategic airlift into theater and operational-level air mobility. Strategic airlift implies any transport aircraft capable of lifting 30-ton vehicles (C-5, C-17, and C-141). Operational-level air mobility implies an extremely robust aircraft, such as SSTOL, capable of landing on short (750-foot) and unimproved strips. For both missions, an AMBF-like force would have to compete for SSTOLs with other demands on available inventories. To pursue such a concept for the Objective Force, the Army would have to procure SSTOLs (or comparable aircraft) or else be assured that the Air Force would procure them and make them available for operations.

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[29]See unpublished RAND research on "The Army After Next: Exploring Air-Mech and Vertical Envelopment Concepts and Technologies" for insights on the feasibility of low-altitude deep penetration operations.

SURVIVABILITY OF BATTLE FORCES

Research Question

How could survivability of the Objective Force be enhanced?[30]

AAN FY99 Battle Forces were light- to medium-weight forces deployed (with one exception—the MABF) by air and maneuvering by air within theater. Like all such forces, they trade passive protection for mobility, causing their survivability to become an issue.

Game Play: Alternative Battle Forces

During the first two years of the AAN process, the Battle Force was configured exclusively as an air-mechanized force, i.e., light armored vehicles combat-delivered by organic tilt-rotor aircraft. While this force had operational advantages in mobility and firepower, it lacked passive protection and could be vulnerable to air defenses. Modern air defenses could severely limit employment options for this Battle Force due to the vulnerability of its tilt-rotor transport aircraft.

In the third year of AAN, the spectrum of Battle Forces employed various deployment methods. LABF could airdrop or airland, depending on the situation. LMBF would normally airland using strategic airlift. AABF could self-deploy using organic JTR aircraft. Its 8-ton Advanced Combat Vehicle (ACV) had even less protection than the 15-ton combat vehicles used by an air-mechanized Battle Force in preceding years. AMBF would normally deploy in USAF-operated SSTOL aircraft. Finally, MABF would normally deploy by fast sealift. (The only major difference between AMBF and MABF was the deployment mode.) Thus, two of the third-year Battle Forces deployed by air into the forward area, typically in close proximity to opposing forces: AABF by JTR and AMBF by SSTOL. These two forces continued to embody the air-mechanized concept that domi-

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[30]This issue relates to the following AAN theme and objectives: "4. Hybrid Force Employment: j. What are the mobility, survivability, lethality, and sustainability implications of light and medium armored vehicles between 4 and 30 tons? r. What are the feasible survivability expectations/limitations of future ground vehicles between 4 and 30 tons, based on the notional ground systems in the FY99 AAN notional battle forces?" *Study and Research Plan,* Annex A.

nated the first two years of the AAN process. The critical difference between these two forces was airlift: AABF had organic JTRs, while MABF had to rely on allocation of SSTOL aircraft. For these two forces, survivability of lift assets continued to be a major issue.

Game Play: Situations Stressing Survivability

Battle Forces had to operate in a variety of situations that stressed survivability. They had to be survivable both while operating on land and while conducting aerial maneuver.

The situations that provided useful insights on survivability were (1) the air movement of Battle Forces (e.g., the 82nd LABF air assaulting to the area around Tbilisi and the 101st AABF and 11th AMBF attacking Agnan and later the valley northwest of Baku), (2) the battle near Agnan between elements of the various Battle Forces (AMBF in Case A and AABF in Case B) and the Red 8th Corps, and (3) the urban battle in portions of Tbilisi. The air movements highlighted the need for suppression of enemy air defenses and aircraft survivability. The Agnan battle pitted light- to medium-weight AAN forces (the 11th AMBF with its 26-ton combat vehicles in Case A or the 101st AABF armed with 8-ton vehicles in Case B) against the Red 8th Corps defending in mixed terrain. This engagement points to the need for survivability against enemy direct- and indirect-fire systems in close combat.

CJEF-B attacked into Tbilisi to establish a LOC linking forces in Georgia with forces in Azerbaijan. During this battle, two U.S. Army XXI brigades, a Strike Force, a MABF, and UK forces attacked a large urban area against well-prepared opposing forces. These Blue forces had to survive in close engagements and against indirect-fire systems that Red employed from inside the city. To operate effectively in this environment, Blue degraded Red C4ISR and hence Red's ability to target Blue forces.

Analysis and Discussion

The game suggested that the Battle Force–type units should be ready to operate offensively and defensively against a variety of threats in many different types of terrain. Aircraft survivability may be as great

an issue as protection of ground systems. By seeking the best way to integrate future Objective Force operations with joint forces and Army XXI capabilities, the potential vulnerabilities of AAN-type organizations could be minimized. Finally, survivability may be significantly improved by degrading the enemy's C4ISR systems.

TRAINING BATTLE FORCE SOLDIERS

Research Question

Will AAN-type operations require new kinds of training for Army soldiers?[31]

Several AAN Franchise Games highlighted the issue of training the future soldier. The higher operational tempo, dramatic increase in unit dispersion, and more flexible tactics envisioned may require new approaches to training soldiers and leaders.

Game Play: Future Training Options

ARSOF Wargame. During the ARSOF Wargame, Blue players wondered if emerging technologies would simplify warfare so that human factors would make less difference than they currently do. They generally agreed that human factors would remain important and might make an even greater difference. As an example, they noted that during the American Civil War eight artillerists could fire several shots per minute from a cannon with very limited destructive force, range, and accuracy. By contrast, during the recent Persian Gulf War, just three artillerists using the Multiple Launch Rocket System could deliver devastating, long-range, highly precise fires. But these three artillerists required far more intensive and sophisticated training than their counterparts in the Civil War. Moreover, their skills were more perishable and required constant refreshment.

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[31]This issue relates to the following AAN theme and objectives: "6. AC/RC Integration: b. For what areas of specialization and to what degree would AC and RC forces be best suited? c. What are the requirements for RC Units to contribute to a rapidly deployable force?" *Study and Research Plan,* Annex A. It also relates to Training, one of the six Army Imperatives (Doctrine, Training, Leader Development, Force Mix, Modern Equipment, Quality People) included in the FY99 AAN process.

AMEDD Game. During the AMEDD Game, the panel thought that future medical units might be joint and also blend staff from a variety of sources, including personnel from U.S. reserve components, allied countries, and nongovernmental organizations. If so, there would be important issues regarding training and standards of care.

Spring Wargame. AAN SWG-99 highlighted a need for the Army to consider training implications associated with Battle Force operational concepts. Battle Force operations are highly dispersed over large geographic areas and conducted at very high operational tempo. When Battle Forces arrive in their objective areas, various elements and even individual vehicles would be far more dispersed than are today's forces. As a result, many junior enlisted leaders would be kilometers away from more senior leaders or even the next friendly vehicle. The generally lower level of combined arms operations, for example individual fighting vehicles having both direct- and indirect-fire capabilities, will place new demands on crew training to ensure that weapons are used appropriately and their effects are properly coordinated. When Battle Forces strike deeply into enemy-held territory, the nearest medical facilities might be hundreds of miles away, thus posing new challenges in terms of immediate medical care to wounded and their subsequent evacuation.

Analysis and Discussion

To realize the operational concepts envisioned for Battle Forces, the Army would have to revise its training regime. This training would have to emphasize individual initiative and decentralized decision-making down to the level of vehicle commanders. Battle Force soldiers would have to become highly self-reliant, accustomed to operating for long periods without immediate supervision or control. There would be a high demand for skilled soldiers in many career fields at relatively low grades, unless Battle Forces were entirely manned by soldiers at mid-enlisted grades and above, as some special operations forces are now. For example, players in the medical franchise game foresaw a need for more highly trained enlisted medics due to the great depth and speed of Battle Force operations. The Special Forces practice of unsupervised individual initiative might become the norm for soldiers assigned to Battle Forces.

The highly dispersed nature of Battle Force operations would place a premium on small unit leaders and unit cohesion. As a result, current personnel rotation policies might require modification to facilitate the type of training and levels of cohesion that such units would require.

HYBRID FORCE EMPLOYMENT

Research Question

How could disparate forces of a hybrid[32] Army achieve the greatest synergy?[33]

In 2022, the Army will include both Army XXI forces and new types of forces, which emerge from the Army Transformation processes. AAN SWG-99 was intended to "assist in developing an operational theory and organizational concepts for the entire hybrid Army force."[34]

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[32]"Hybrid" implies disparate levels of modernization:

> Given the costs of modernization, the tyranny of developmental/acquisition timelines, and the unpredictability of technological breakthroughs, the fielding of a hybrid force is both unavoidable and entirely appropriate. However, the differences inherent within the Army of 2025 will likely be more pronounced and more visible than today due to the capability gap that will exist between elements of the force equipped with current and emerging (evolutionary) technologies and those equipped with leap-ahead technologies (revolutionary). The hybrid force of 2025 will be forged from a range of functions, force structures, and capabilities spanning 20–25 years, from modernized AOE organizations to AAN Battle Forces, each optimized for a specific set of missions and circumstances, but adaptable to meet a broad range of conditions.

Knowledge and Speed, 1998, p. 11.

[33]This issue relates to the following AAN theme and objectives: "4. Hybrid Force Employment: a. What operational concepts, structure, and inherent capabilities prove most useful in combat operations? Least useful? c. What are the strengths and limitations of the various campaign alternatives considered by the CINC? d. To what extent and in what ways will differences in speed and agility among AAN-era forces affect force cohesion and battlespace coherence? e. How are information operations translated into operational effects that contribute to campaign objectives? f. How will space-based operations contribute to the conduct of operations in 2020–2025? n. How do staffs employ these forces differently? The same? What are the outcomes of these employment scenarios?" *Study and Research Plan*, Annex A.

[34]U.S. Department of the Army, *Army After Next Spring Wargame–99, Game Book*, Headquarters, U.S. Army Training and Doctrine Command (prepared by Booz-Allen & Hamilton under contract), Fort Monroe, VA, 1999, p. 1.

The game showed that both Army XXI and Battle Forces would have appropriate roles in a hybrid force. During AAN SWG-99, the main roles of Army XXI units were in combat service support and theater missile defense. In Case B, Army XXI maneuver forces had few opportunities for employment in combat. Instead, coalition forces (which were assumed to be very capable, generally self-supporting, and available in considerable quantity) performed many of the roles that might have been performed by Army XXI forces.

Game Play: Hybrid Force Operations

The game provided limited opportunities to examine the operations of a hybrid Army. Case A included Strike Forces and 11th AMBF, while Case B included Strike Forces and one example of each type of Battle Force (see Appendix C). In both cases, the major contribution of Army XXI units were in combat service support and theater missile defense. The game offered few opportunities to assess operations that combined Army XXI and future Army maneuver units. In general, coalition forces (which were assumed to be very capable, generally self-supporting, and available in considerable quantity) performed many of the roles that might be expected of U.S. Army XXI–type organizations. Relatively few Army XXI maneuver units entered combat by the end of game play in both cases. For example, in Case B only two Army XXI heavy brigades were in combat (near Tbilisi, where a Strike Force was also operating) at the end of the game. The main contribution of Army XXI maneuver units in Case A was to seize lodgments near Agnan in Azerbaijan to facilitate the subsequent arrival of the AMBF.

Part of the reason for the limited ability to evaluate the hybrid force was that Battle Forces, when combined with air, naval, and coalition ground forces, were assessed to be so overwhelming. Essentially, whenever Blue ground forces engaged a Red unit, whether in the open, in defensive positions, or in urban areas, Red was defeated, usually with very heavy casualties to Red. Whether Blue forces would have actually been this successful against the conventional forces of a major competitor remains an open issue. Based strictly on game play, there was little need for Army XXI maneuver units.

In Case A, there were few opportunities to assess the AAN ground force mix. During initial entry into Azerbaijan, U.S. Rangers and

elements of the 82nd Airborne Division seized the Agdam airfield and surrounding terrain, allowing the U.S. 11th AMBF to airland without opposition. Later, one brigade of the 82nd Airborne Division parachuted into the vicinity of Baku and linked with one regiment of the 11th AMBF operating west of the city. But the 11th AMBF operated in closer cooperation with German and British air assault brigades. Moreover, CJEF-A players tended not to dwell on land force operations because they were highly successful and presented few challenges other than resupply.

In Case B, the more futuristic force, there was little opportunity to gain insights on the hybrid force. The assessed potential of Battle Forces and coalition units, plus air and naval power, resulted in heavy losses to Red's conventional combat force prior to the commitment of Army XXI forces. Indeed, in Case B only two Army XXI Heavy Brigades and a Strike Force managed to enter combat before the end of the game. It should be recognized, however, that the majority of the theater logistics and missile defense units would have been Army XXI type, and those organizations played a critical role in the campaign.

Analysis and Discussion

RAND Insight: Battle Forces, when combined with air, naval, and coalition ground forces, were assessed to be overwhelming. Essentially, whenever Blue ground forces engaged a Red unit, Red was defeated. Based strictly on game play, there was little need for Army XXI maneuver units, particularly in Case B. By the end of the game, Blue had routed or defeated Red while employing a small fraction of the Army's total force structure. If the assessment process had concluded that the Battle Forces were less successful, the role of Army XXI forces would have been greater.

In both cases, U.S. air and naval forces, elements of a MEF, Army Strike Forces, a small number of Army Battle Forces (just one AMBF in Case A), and coalition forces rapidly defeated a major competitor within the area of operations. The Battle Forces and their complementary coalition and joint forces proved capable of defeating Red with little assistance from Army XXI elements. This outcome would indicate that by employing Battle Forces, the United States could defeat a major competitor with much smaller but more capable land

forces. However, if the assessment process had concluded that the Battle Forces were less successful, the role of Army XXI forces would have been greater.

In addition, TRADOC posed several research questions associated with the hybrid force. These questions (in italics) and responses follow:

What operational capabilities and concepts appeared to provide the greatest or least utility in combat operations?

The great mobility of Battle Forces and other air-mobile units provided CJEF commanders with operational flexibility and allowed high operational tempo. But as noted above, survivability of supporting aircraft and feasibility of logistics support over great distances need further examination.

The concept that appeared to have the least utility in AAN SWG-99 was the optimization of one type of Battle Force (LMBF) for urban operations. When the CJEF-B commander had to conduct urban operations, he had insufficient time to deploy this optimized unit. Instead, he employed forces in the immediate vicinity of the urban area. If, as this example suggests, optimization is impractical, Army forces should be broadly capable of conducting operations in urban terrain.

How do staffs employ these forces differently? What employments are the same?

Once deployed, all Battle Forces enjoyed about the same success in defeating Red land forces. Staffs quickly understood that successful deployment equated with combat success. Therefore, AAN SWG-99 did not expose significant differences for employment of the Battle Forces, excepting the MABF because it was sealifted while the others were airlifted.

During the final game move in Case B, there was considerable discussion about which forces to employ in the assault on Tbilisi. Although the CJEF-B staff decided to use the forces at hand, it would

have preferred to use more-capable U.S. Army XXI and coalition heavy forces.[35]

How are information operations translated into operational effects that contribute to campaign objectives?

IO Wargame. During the IO Wargame, Blue used a "strategy-to-tasks"[36] approach to plan IO in the context of a joint campaign. The planners started with operational objectives implied by the overall mission. They identified desired effects, general actions, and specific actions that would help attain these operational objectives. For the specific actions, they identified measures of effectiveness (MOE). In addition, they identified required intelligence support, preparatory actions, decision points, and associated risks. For example:

Operational objective: Protect deployed forces.

Desired effect: Reduce Red ability to interdict Blue Battle Forces.

General action: Deceive Red about Battle Force locations.

Specific action: Deploy SOF with multispectral imaging system to misrepresent Blue operations.

Measure of effectiveness: Percentage of Red sensors misidentifying Blue landing zones and pickup zones.

Intelligence support: Human intelligence on SOF insertion points.

Preparatory actions: SOF insertion.

Decision point: D+1.

Associated risks: Casualties to SOF teams; possible compromise (by inference) of actual landing zones and pickup zones.

As time permitted, Blue planners entered all this data into spreadsheets that linked IO and other joint operations in an integrated operational plan.

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[35]RAND Arroyo Center interview with the Case A J-3, conducted after the Tbilisi assault had been planned.

[36]For a discussion of the "strategy-to-tasks" methodology, see Bruce R. Pirnie and Sam Gardiner, *An Objectives-Based Approach to Military Campaign Analysis*, Santa Monica, CA: RAND, MR-656-JS, 1996.

In contrast to the Blue top-down approach, Red took a bottom-up approach to IO. The Red commander challenged his staff to envision specific actions during each phase of operations. Red planners analyzed these actions according to the IO objective, battle space geometry, tools and means, MOE, and phase. For example:

IO objective: Affect Blue's ability to decide and respond.

Battlespace: Main battle area (Azerbaijan and Georgia).

Tools and means: Insertion of "Trojan Horse."

Measure of effectiveness: Delay in Blue response.

Phase: Post-D-day support.

Spring Wargame: Red and Blue continually tried to obtain an advantage through information operations. The implications for hybrid forces are not clear, but Battle Forces would be at much greater risk, especially during deep maneuver, if Blue could not attain a substantial advantage in situational awareness. Blue needed to know the locations of Red forces in near-real time and deny such knowledge about its own forces.

What are the strengths and weaknesses of the operations executed in this campaign?

The aggressive Blue plans were designed to achieve strategic preclusion. In both cases, Blue initiated offensive operations very early in the campaign. Assessment judged these operations to be very successful. Red was defeated in engagement after engagement and by game's end was almost entirely beaten.

The Blue concept of operations was to decisively engage Red forces before they could properly prepare to defend Azerbaijan and Georgia. This concept implied accepting risk in going on the offensive while Red had larger forces in the area of operations. When Blue initiated offensive operations (roughly D+6 in Case B and D+11 in Case A), Red still had larger forces available. By starting offensive operations so early, Blue had little time to inflict attrition on Red forces with joint fires before making contact on the ground. If Blue's logistics effort had been disrupted during offensive operations, Blue and Green ground units in Azerbaijan and Georgia would have been in

precarious situations. Ground units in Azerbaijan were especially at risk because their sustainment depended entirely on an air bridge.

To what extent and in what ways will differences in speed and agility among future Army forces affect force cohesion and battlespace coherence?

We do not know the answer to this question.

From a mobility perspective, there were essentially two different types of forces: those which maneuvered by air (AABF, AMBF, LABF, 82nd Airborne Division, and Strike Forces) and those which maneuvered by land (MABF and LMBF, and most Army XXI units). Among the coalition forces, there was a similar distinction; some coalition units could move by air, while others could not. Forces which could maneuver by air proved the most versatile, but additional research is required to examine feasibility and affordability of the associated concepts.

On several occasions, air-maneuvering units penetrated deep into enemy-held territory (e.g., lodgment at Agnan in Azerbaijan in both Case A and Case B), far in advance of land-maneuvering units. Had Red disrupted the air bridges supplying these forces or delayed ground advance of Blue and Green heavy forces, the deep penetrating forces would have been endangered. Moreover, Blue needed closure of land-maneuvering units with air-maneuvering units to assure defeat of Red forces.

German operations in Russia during 1941 provide an analogy. The Germans repeatedly broke through Soviet defenses and advanced quickly in operational depth with armored formations (groups and armies). If the Red Army could counterattack, these armored formations were at risk until infantry divisions closed, usually at the speed of road-marching soldiers. Moreover, Soviet forces could break through an encirclement held only by armored formations. It took the greater staying power of German infantry divisions to hold an encirclement. Thus, common effort by armored formations and infantry divisions, the two main components of a hybrid force, was essential to the spectacular German victories during the summer and

fall of 1941. [37] It was the complementary employment of infantry and armor forces that led to the greatest successes of the Wehrmacht. Similarly, accurately assessing the strengths and weaknesses of Army XXI and AAN forces and developing complementary concepts of operations should result in an optimal balance of capabilities.

How will space-based operations contribute to the conduct of operations?

Army XXI forces, Strike Forces, and Battle Forces will all benefit from space-based operations that provide positional navigation, surveillance, reconnaissance, and communications. Space-based operations will be especially important to maintain connectivity across a hybrid force operating in a highly fluid and dispersed fashion. Therefore, protection of U.S. space-based assets will be critical to success of future Army forces. Recognizing the nation's dependence on space assets, the Department of Defense recently announced that "Purposeful interference with U.S. space systems will be viewed as an infringement on our sovereign rights."[38]

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[37] Throughout World War II, the German army was a classic hybrid force. Germany never produced enough armored vehicles and motor transport to modernize its entire army. As a result, its infantry divisions relied on miscellaneous truck types, most designed for civilian use, and horse-drawn wagons for transportation beyond railheads. In Russia, horse-drawn wagons predominated, especially after severe climate and poor road conditions incapacitated many of the trucks. Maneuver in the field was limited by the speed and endurance of infantry on foot. Indeed, even the more modern armored divisions lacked sufficient numbers of satisfactory infantry carriers, with the result that infantry sometimes rode into combat clinging to tanks, as was also the practice in the Red Army. See Thomas E. Griess (ed.), *The West Point Military History of the Second World War, Europe and the Mediterranean*, New Jersey: Avery Publishing Group, Inc., 1989.

[38] Secretary of Defense William Cohen, in a memorandum forwarding Department of Defense space policy, dated July 9, 1999, as reported in John Donnelly, "Cohen: Attack on U.S. Satellite Is Attack on United States," *Defense Week*, July 26, 1999, p. 2. In the same memorandum:

> The U.S. may take all appropriate self-defense measures, including, if directed by the National Command Authorities, the use of force, to respond to such an infringement of our rights.... U.S. space systems are national property afforded the right of passage through and operations in space. In this regard, space is much like the high seas and international airspace.

CONCLUSION

This chapter offers conclusions and broad insights from the FY99 series of AAN games. They reflect RAND's view of the AAN process, for which RAND is solely responsible.

COALITION WARFARE

FY99 AAN focused on a coalition of the United States and its European allies. But two of three AAN SWG-99 scenarios replayed to a great extent the alignment of powers during the Cold War. Moreover, all of these coalitions tended to be remarkably free of problems.[1] In the real world, coalitions may be difficult to form quickly and hard to lead effectively. At the very least, they will be affected by technical, organizational, and cultural incompatibilities. Moreover, there are likely to be serious differences in political goals and strategies, even within the inner circle of U.S. security partners. Coalition partners are seldom content just to provide forces and therefore portraying them as docile providers during games is unrealistic. Usually, coalition partners want to make strategy serve their own needs and reflect their particular concerns. To address these problems, AAN needs to take a broader and more realistic look at coalition warfare.

AAN wargames would benefit from more realistic play of coalition operations. Coalition members could be given strategic goals and

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[1]An interesting exception occurred during the first Spring Wargame when Blue's allies succumbed to Red blandishments and denied Blue critical basing rights. Game Direction intervened to make the coalition more reliable for Blue.

hence campaign objectives that differ substantially from U.S. views. They could set conditions for their participation in the coalition. They could try to constrain rules of engagement and place limits on certain kinds of military operations. Or they might behave more aggressively than the United States would prefer. Requiring more realism would help generate more insights into the coalitions, especially the Army's role in helping build and maintain them.

In addition, the role of Objective Forces within coalitions needs exploration. Leap-ahead technologies would give Objective Forces capabilities unmatched even by the closest U.S. allies and also create technical incompatibilities. One solution would be a division of labor with Objective Forces executing stand-alone missions, e.g., deep penetration and exploitation. But divisions of labor tend to strain coalitions, especially when some powers feel they are running disproportionate risks, and they may not attain optimal synergisms for unlike forces. Despite gross disparity in capabilities, the future Objective Forces might be able to operate closely with coalition forces, magnifying their combat power. If so, Objective Forces should prepare in peacetime through forward deployment and combined exercises.

HYBRID U.S. ARMY FORCES

From the inception of the AAN project, the Army has assumed that its forces in 2020–2025 will be hybrid, i.e., a mix of Army XXI units and more modern forces, represented conceptually by Battle Forces. The past three AAN games generated insights into how these disparate forces might operate together.[2]

During the first two AAN games, AAN forces were rushed into theater, to be followed by Army XXI units. Battle Forces arrived earlier and maneuvered more rapidly, including operational maneuver by air. They attempted to destroy or disrupt opposing forces before they could respond effectively. Army XXI forces arrived later and maneuvered more slowly on land. They consolidated the gains made

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[2]For many years, the Objective Force will also be hybrid. Although the Transformation Plan calls for an Objective Force that encompasses the entire Army, it is likely that current capabilities will still exist in the Army of 2020.

by Battle Forces and accomplished essential missions, especially seizure of key urban areas, that exceeded the capabilities of Battle Forces.

During AAN SWG-99, Battle Forces operated in conjunction with powerful U.S. Air Force, Navy, and Marine Corps elements and highly capable coalition forces, including mechanized and air-mobile forces. In contrast with earlier iterations, they had less opportunity to operate in conjunction with Army XXI units, particularly in Case B, which was the more modernized U.S. force. Instead, Army XXI forces provided specialized functions such as air defense and logistics support. Coalition ground forces had the roles played by Army XXI forces during previous iterations, especially in Case B. To more fully understand the implications of a hybrid force, future games should have scenarios that promote common operations rather than divisions of labor.

SPECTRUM OF BATTLE FORCES

During its first two years, the AAN project focused attention on ground forces that employed some form of airlift in theater. Indeed, such airlift was considered necessary to attain sufficiently rapid maneuver:

> Some form of theater/tactical airlifter—whether that be a vertical takeoff and landing (VTOL), super-short takeoff and landing (SSTOL) or Joint Transport Rotor (JTR)—must be developed and fielded in considerable numbers to obtain this breakthrough in ground force speed.[3]

But during the third year, the AAN project examined Battle Forces, which used other operational concepts. At one end of the spectrum, the LABF with 2.5-ton vehicles could airdrop into a theater of operations, while at the other end, the MABF with 26-ton vehicles went by sealift. Appendix C provides a brief summary of the various types of Battle Forces that were examined in AAN SWG-99.

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[3]*Knowledge and Speed*, 1998, p. 10.

Previous iterations of the AAN cycle featured just one type of Battle Force based on an air-mechanized concept. This concept offered advantages of global self-deployment, vertical maneuver, and precision fires. But it also had severe limitations: inability to fight in urban terrain, inability to hold terrain, and vulnerability to opposing air defense.[4] In view of these limitations, there was a need for more force types based on other concepts. AAN SWG-99 answered this need by introducing four new types of Battle Forces (five if AMBF and MABF are considered different types). The heaviest of these (AMBF/MABF) had 26-ton vehicles, while the LABF was armed with 2.5-ton systems. This move toward multiple types of notional Battle Forces provides more options for exploration. In AAN SWG-99, the AMBF had organic airlift, while the MABF deployed primarily on fast ships.

As the Army Transformation process continues, TRADOC should consider a wide range of alternative forces and operational concepts. From the perspective of game preparation, this will require that new force designs be finalized in time for tactical and logistics planners to assess the capabilities of the hypothetical organizations. Now that the Army is clarifying its Transformation Plan, future games will examine various issues associated with the envisioned Interim and Objective Forces (whose ultimate character is undetermined at the time of this writing), and contribute to the understanding and evolution of the organizations associated with the goals of Transformation.

Ultralight Battle Forces

There is no *a priori* reason to assume that a future force would employ land vehicles of any particular size and weight, or any land vehicles at all. Indeed, during the second iteration of the AAN cycle, the light Battle Force practically dispensed with ground vehicles. A force of this sort might operate in ways comparable to today's special operations forces, such as Rangers and Army Special Forces, when employed in direct action missions with strong air support. Once

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[4]See Walter L. Perry, Bruce R. Pirnie, and John V. Gordon, *Issues Raised During the Army After Next Spring Wargame*, Santa Monica, CA: RAND, MR-1023-A, 1999, pp. 39–42.

inserted, it might maneuver on foot or by small, ultralight ground and air vehicles. There are obvious risks and limitations to this concept, but perhaps not greater than those already incurred by vehicles in the 2.5-ton class, as employed by the LABF during AAN SWG-99.

Air-Mechanized Battle Forces

During AAN SWG-99, the AABF (8-ton combat vehicles transported by JTR) embodied the air-mechanized concept, but at a lower degree of effectiveness than the previous air-mechanized force (15-ton vehicles transported by specially developed tilt-rotor aircraft). In the end, an air-mechanized concept might be infeasible, unaffordable, or both, but until such a determination it should have stayed in the running. To be fully understood, an air-mechanized force should be considered as a candidate for the Objective Force.

Heavier Battle Forces

The Future Combat Vehicle, as played in AAN SWG-99, weighed no more than 26 tons on the assumption that a follow-on aircraft to the C-130 would be able to lift 30 tons. But such an aircraft may not be built, or may not be available in large numbers in the 2030 time-frame. Moreover, building a 26-ton vehicle with sufficient survivability in close combat would be difficult, even assuming great improvements in active protection. Therefore, there is merit in examining heavier Battle Forces that cannot conduct operational maneuver by air as well as lighter Battle Forces that can perform such maneuver.

Since the announcement of the Army Transformation Plan in the fall of 1999, the focus of future Army research will be on Interim and Objective Force organizations and concepts. Many of the issues that appeared in AAN SWG-99 merit examination, even though since the end of AAN SWG-99, the Army is no longer actively considering Battle Forces. Issues about deployment speed, feasibility of strategic preclusion, coalition operations, and insights on the strengths and weaknesses of new organizations in relation to Army XXI forces will all require considerable research, even though the specific organizations included in AAN SWG-99 have been overtaken by the Transformation Plan concepts.

ISSUES IDENTIFIED IN THIS REPORT

This appendix relates issues identified in this report to themes and issues presented in the *Army After Next FY99 Study and Research Plan*, Annex A. Some broad, overarching issues relate to more than one theme.

Table A.1

Issues Identified in This Report

Issue	AAN Theme	AAN Issue(s)
Coalition Warfare	1. Strategic Setting	e. What new challenges will the strategic environment of 2025 pose for the conduct of military operations and the establishment or sustainment of security alliances?
	9. Coalition Operations	a. What essential characteristics and capabilities must AAN forces possess to enable interoperability in combined commands?
		d. How can coalition forces be most effectively employed with forces conducting operations in urban terrain?
Strategic Preclusion	1. Strategic Setting	c. How does the enemy operational concept challenge U.S. forces?
	2. Force Projection	h. What are the most promising approaches for meeting force projection requirements in support of strategic preclusion?
	4. Hybrid Force Employment	c. What are the strengths and limitations of the various campaign alternatives considered by the CINC?

Table A.1—continued

Issue	AAN Theme	AAN Issue(s)
Nuclear-Armed Opponent	1. Strategic Setting	i. How does possession of WMD by nations and transnational organizations affect U.S. decisions to conduct military operations?
	7. Homeland Defense	e. How will proliferation of WMD affect the military role in homeland defense?
Exploitation of Space	1. Strategic Setting	a. How do political, economic, social, demographic, and information situations as they exist in 2022 affect the nature of military responses to the crisis?
	2. Force Projection	b. What are the critical information requirements for force projection and entry operations?
	4. Hybrid Force Employment	f. How will space-based operations con-tribute to the conduct of operations in 2020–2025?
Sea Control	8. Joint Operations/ Interdependence	a. What tasks will the Army depend on other services or governmental organiza-tions to perform?
Air Superiority	2. Force Projection	d. How can critical force projection assets be protected?
	8. Joint Operations/ Interdependence	a. What tasks will the Army depend on other services or governmental organizations to perform? b. What interdependencies and/or redundancies must be maintained?
Sustainment	3. Sustainment	b. How do various logistics concepts to include swarms, caches, and robotic forces impact military operations? e. What are the sustainment challenges associated with hybrid force entry operations? i. What are the implications of emerging medical organizational and operational concepts on seamless integration of health support?

Table A.1—continued

Issue	AAN Theme	AAN Issue(s)
Urban Terrain	5. Urban/Complex Terrain	a. What are the critical limitations and vulnerabilities associated with employment of future Army forces in large urban areas?
		b. What operational concepts, organizations, and capabilities should be used during the employment of future Army forces in large urban areas?
Refugees During Conflict	1. Strategic Setting	b. What are U.S. vulnerabilities (military and civilian) to asymmetric threats during all phases of military operations, in theater and external to the theater?
	9. Coalition Operations	c. What are the tasks that the military depends on civilian and coalition organizations to perform in response to this crisis?
		e. What tasks are the Army expected to perform for civilian and coalition partners in this crisis?
Air Mobility of Battle Forces	4. Hybrid Force Employment	i. Which air delivery means (STOL, SSTOL, VTOL) provides significant increases in vertical envelopment capability of middleweight forces?
		q. What are the survivability implications of the theater air transport alternatives for the FY99 AAN notional battle forces (C-130, SSTOL, JTR)?
Survivability of Battle Forces	4. Hybrid Force Employment	j. What are the mobility, survivability, lethality, and sustainability implications of light and medium armored vehicles between 4 and 30 tons?
		r. What are the feasible survivability expectations/limitations of future ground vehicles between 4 and 30 tons, based on the notional ground systems in the FY99 AAN notional battle forces?
Training Battle Force Soldiers	6. AC/RC Integration	b. For what areas of specialization and to what degree would AC and RC forces be best suited?
		c. What are the requirements for RC units to contribute to a rapidly deployable force?

Table A.1—continued

Issue	AAN Theme	AAN Issue(s)
Hybrid Force Employment	4. Hybrid Force Employment	a. What operational concepts, structure, and inherent capabilities prove most useful in combat operations? Least useful?
		c. What are the strengths and limitations of the various campaign alternatives considered by the CINC?
		d. To what extent and in what ways will differences in speed and agility among future Army forces affect force cohesion and battlespace coherence?
		e. How are information operations translated into operational effects that contribute to campaign objectives?
		f. How will space-based operations contribute to the conduct of operations in 2020–2025?
		n. How do staffs employ these forces differently? The same? What are the outcomes of these employment scenarios?

SELECTED ARMY FORCES IN AAN SWG-99

This appendix identifies salient Army units played in Case A and Case B during AAN SWG-99. Both cases played the same set of Strike Forces, and one Battle Force (11th Air-Mobile Battle Force) was common to both cases. Case A had just this one Battle Force, while Case B had a spectrum of Battle Forces and therefore represented a more modernized Army. For easier identification, Battle Forces are in bold type.

Table B.1

Army Forces in Cases A and B

Case A: Evolutionary	Case B: Leap Ahead
Airborne, Air Assault, Mountain:	
82nd Airborne Division, Fort Bragg, NC (AC)	82nd **Light Airborne Battle Force (LABF)**, Fort Bragg, NC (AC)
101st Airborne (Air Assault) Division, Fort Campbell, KY (AC)	101st **Air Assault Battle Force (AABF)**, Fort Campbell, KY (AC)
10th Mountain Light Motorized Division, Fort Drum, NY (AC)	10th Mountain **Light Motorized Battle Force (LMBF)**, Fort Drum, NY (AC)
Strike Forces:	
2nd Strike Force, Fort Polk, LA (AC)	
3rd Strike Force, Fort Lewis, WA (AC)	
11th Strike Force, Fort Riley, KS (AC)	
173rd Strike Force, Vincenza, Italy (AC)	

Table B.1—continued

Case A: Evolutionary	Case B: Leap Ahead
Other Battle Forces:	
11th **Air-Mobile Battle Force (AMBF)**, Fort Lewis, WA (AC)	
(no counterpart)	9th **Light Motorized Battle Force (LMBF)**, Fort Lewis, WA
25th Infantry Division, Schofield Barracks, HI (deployed to Indonesia)	25th **Light Motorized Battle Force (LMBF)**, Schofield Barracks, HI (deployed to Indonesia)
1st Cavalry Heavy Division, Fort Hood, TX	1st Cavalry **Mech-Armor Battle Force (MABF)**, Fort Hood, TX
4th Infantry Division (Mechanized), Fort Hood, TX	4th **Mech-Armor Battle Force (MABF)**, Fort Hood, TX

SOURCE: U.S. Department of the Army, Army After Next Spring Wargame '99, *Reference Book Volume I (Policy and Forces), Military Forces: U.S. Military Forces,* U.S. Army Training and Doctrine Command, Fort Monroe, VA, 1999, pp. 5–18.

CHARACTERISTICS OF BATTLE FORCES

This appendix summarizes important characteristics of Battle Forces played in AAN SWG-99.

Table C.1

Characteristics of Battle Forces

	LABF	LMBF	AABF	AMBF/MABF
Typical missions	Crisis response, forced entry against light resistance	Forced entry; control over complex terrain and populations	Forced entry, vertical envelopment, decisive combat	Early entry, decisive combat
Strategic deployment CONUS to combat (time to accomplish)	Strategic airlift: airdrop or airland (2 days)	Strategic airlift: airland (7 days)	Strategic airlift: airland; self-deploy by JTR (3 days)	AMBF: strat airlift & SSTOL (3 days) MABF: strat airlift & fast ship (5–10 days)
Operational/ tactical maneuver in theater	Foot, vehicular, parachute, UH-XX, JTR	Vehicular, JTR	Vehicular, JTR	Vehicular, SSTOL
Personnel	12,000	11,200	13,851	10,390
Combat vehicles	1,950 2.5-ton LACV-S	181 8-ton ACV-CBT	864 8-ton ACV-CBT	324 26-ton FCV-CBT; 216 26-ton FCV-FIFV

Table C.1—continued

	LABF	LMBF	AABF	AMBF/MABF
Fire support systems	216 ACV-A120TM; 36 FCV-AHIMARS; 36 FCV-AMSPH; 772 ARES	216 ACV-A120TM; 36 FCV-AHIMARS; 36 FCV-AMLRS; 108 FCV-AMSPH; 196 ARES	72 FCV-AHIMARS; 108 FCV-AMSPH; 205 ARES; 464 ARCAS	12 FCV-AHIMARS; 257 ARES; 261 ARCAS
Aviation*	40 JTR; 40 UH-XX; 36 RAH-66	40 JTR; 60 UH-XX; 36 RAH-66	480 JTR; 37 UH-XX; 72 RAH-66	40 JTR; 44 UH-XX; 72 RAH-66

*In addition, the U.S. Air Force had 410 Super Short Takeoff and Landing (SSTOL) aircraft, which could support Battle Force operations.

Abbreviations: Advanced Combat Vehicle—Combat (ACV-CBT); Future Combat Vehicle—Advanced High Mobility Rocket Systems (FCV-AHIMARS); Advanced Robotic Counter Air System (ARCAS); Advanced Robotic Engagement System (ARES); Attack Helicopter (AH); Advanced 120mm Turreted Mortar (ACV-A120TM); Future Combat Vehicle—Combat (FCV-CBT); Future Combat Vehicle—Future Infantry Fighting Vehicle (FCV-FIFV); Future Combat Vehicle—Advanced Modular Self-Propelled Howitzer (FCV-Air AMSPH); Joint Transport Rotorcraft (JTR); Light Airborne Combat Vehicle—Stealth (LACV-S); Reconnaissance-Attack Helicopter (RAH); Utility Helicopter (UH).

SOURCE: U.S. Department of the Army, *Army After Next, FY99 Battle Forces & Notional Systems,* Draft Version 4.0, Deputy Chief of Staff for Doctrine, U.S. Army Training and Doctrine Command, Fort Monroe, VA, April 15, 1999.

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